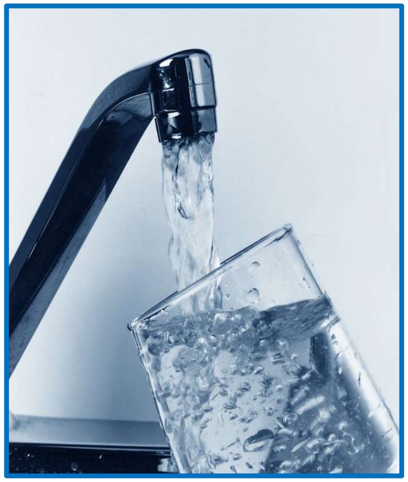
Alameda County Water District

Water Resources Planning Workshop:

Water Resources Master Plan – Phase 2



ACWD Board Workshop
August 28, 2025
Agenda Item 4

Water Resources Master Plan 2050:
Portfolio Evaluation & Selection

August 28, 2025

Presenters:

Thomas Niesar, ACWD, Water Supply & Planning Manager
Persephene St. Charles, Woodard & Curran
Phillippe Daniel, Liquisti

Acronyms used in this presentation

AF	Acre-feet
GW	groundwater
kWh	kilowatt-hour
NDF	Newark Desal Facility
PFAS	per- and polyfluoroalkyl substances
SFPUC	San Francisco Public Utilities Commission
SGMA	Sustainable Groundwater Management Act
SLR	sea level rise
SWP	State Water Project
TP	Treatment Plant
WR	Water Resources
WRMP	Water Resources Master Plan
UWMP	Urban Water Management Plan

Objectives for today's workshop

Share updates on planning process

Discuss policy decisions related to portfolio evaluation and selection

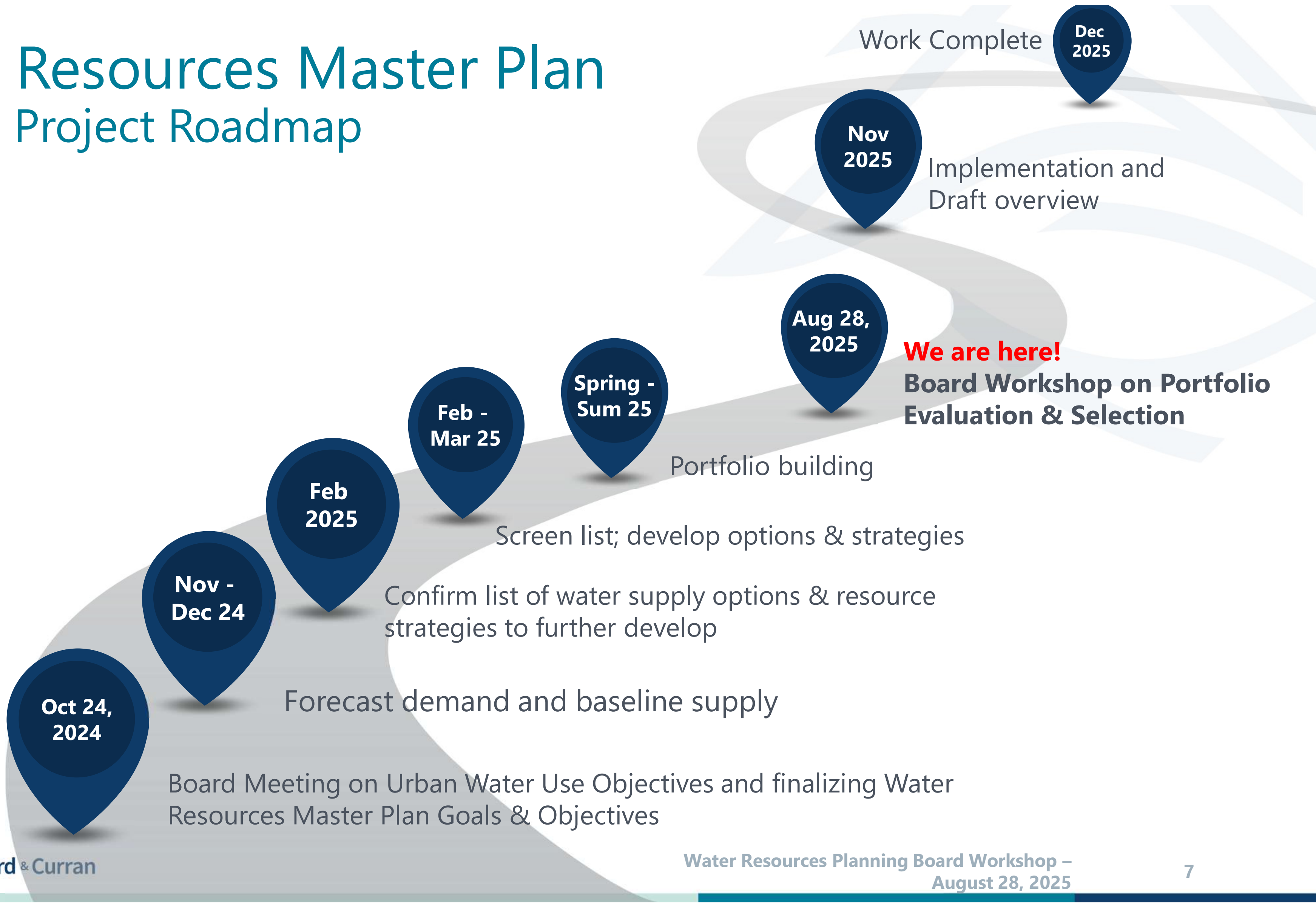
Confirm portfolio to develop for implementation planning

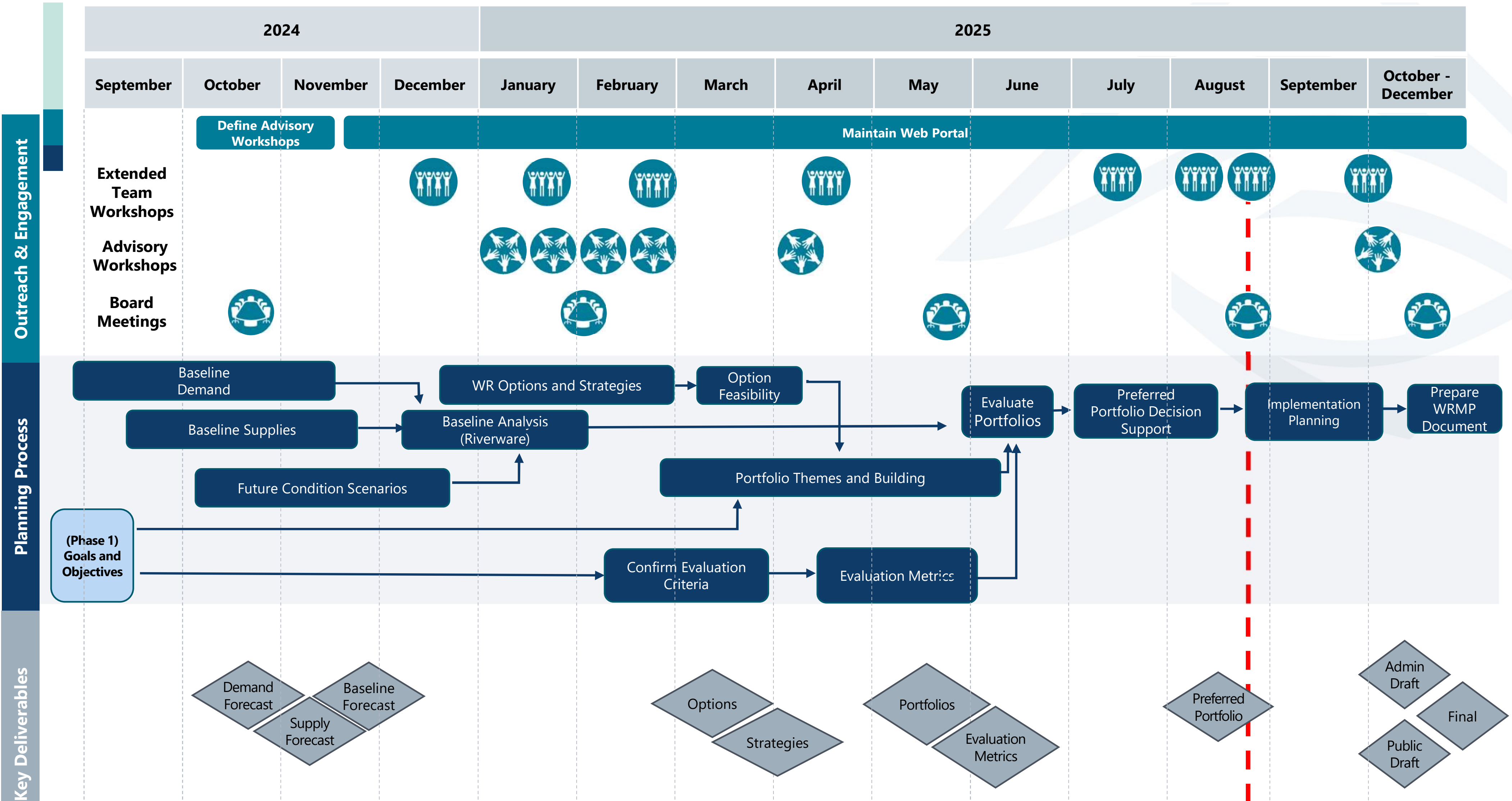
Agenda

- Update: Planning Process
- Overview: Portfolio Evaluation and Comparative Analysis
- Discussion: Portfolio Selection
- Preview: Implementation Planning
- Discussion: Implementation Considerations
- Next Steps

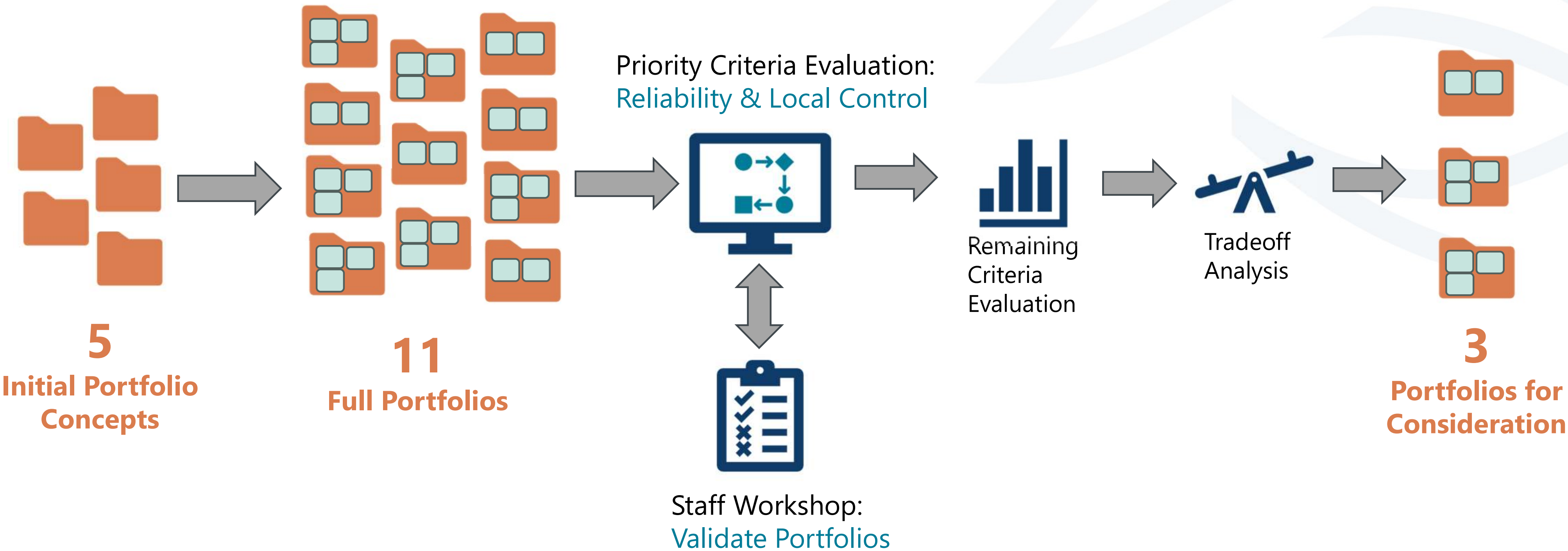
Planning Process

Water Resources Master Plan
Phase 2 Project Roadmap



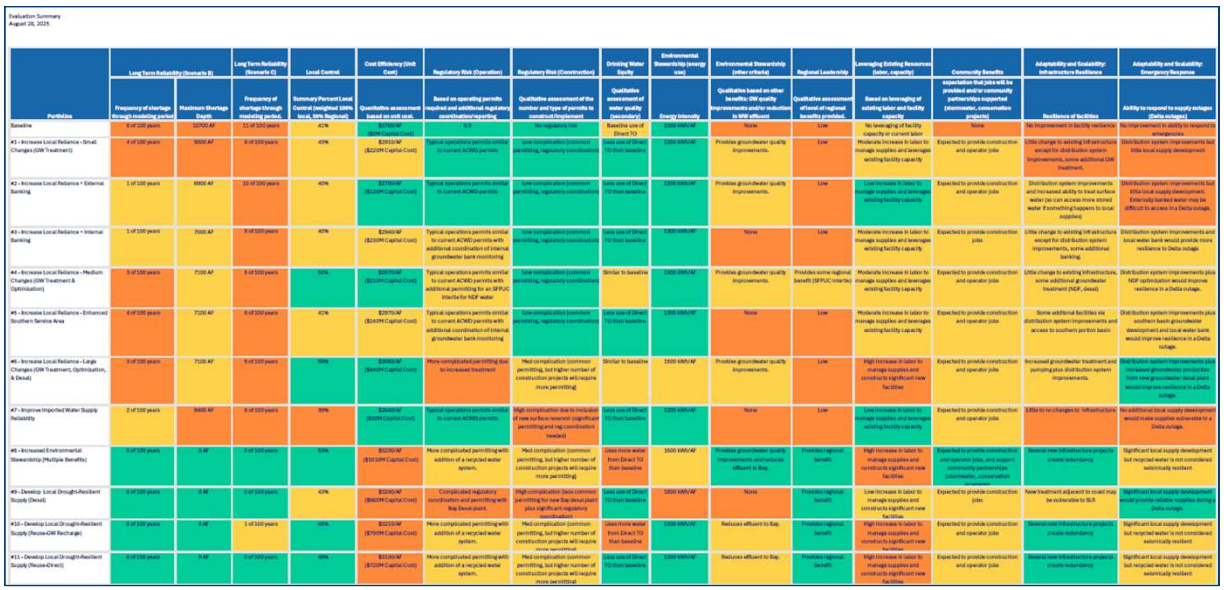

2024
2025
September
October
November
December
January
February
March
April
May
June
July
August
September
October - December
Outreach & Engagement
Define Advisory Workshops
Maintain Web Portal
Extended Team Workshops
Advisory Workshops
Board Meetings
Planning Process
Baseline Demand
Baseline Supplies
Baseline Analysis (Riverware)
Future Condition Scenarios
WR Options and Strategies
Option Feasibility
Portfolio Themes and Building
(Phase 1) Goals and Objectives
Confirm Evaluation Criteria
Evaluation Metrics
Evaluate Portfolios
Preferred Portfolio Decision Support
Implementation Planning
Prepare WRMP Document
Key Deliverables
Demand Forecast
Supply Forecast
Baseline Forecast
Options
Strategies
Portfolios
Evaluation Metrics
Preferred Portfolio
Admin Draft
Public Draft
Final

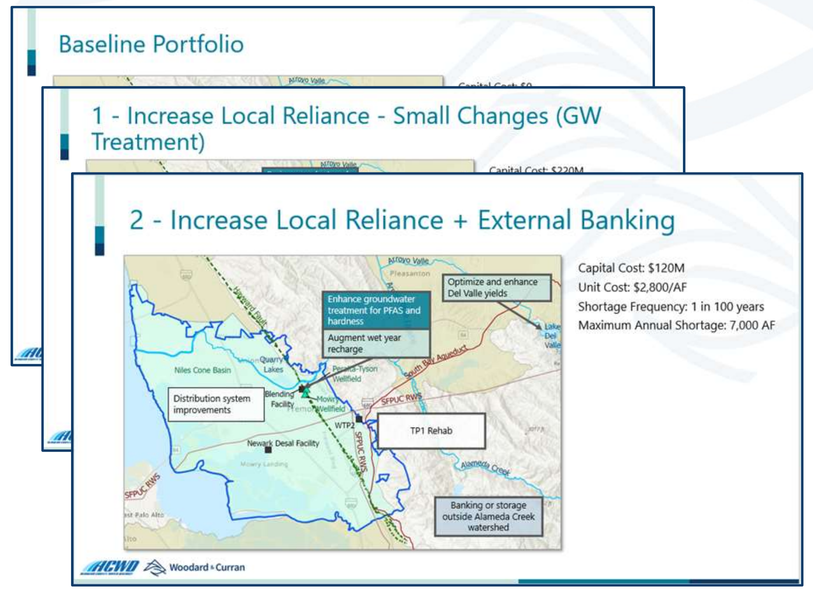
Additional portfolios were developed then refined



Portfolio Evaluation and Comparative Analysis

An evaluation matrix and individual portfolio sheets can be used as a reference





Evaluation criteria were used in two ways

Reliability *(climate, supply risk)*	**Cost Efficiency**	**Regulatory Risk** *(permitting, regulatory risk)*
Drinking Water Equity	**Environmental Stewardship**	**Local Control** *(conveyance, contract risk)*
Regional Leadership	**Leveraging Resources**	**Community Benefits**
	Adaptability/Scalability	

- Portfolios were evaluated using all criteria
- Highest priority criteria were used for comparative analysis along with cost

Future condition scenarios were used to test reliability

Scenario A ("Mild")	Scenario B ("Moderate")	Scenario C ("Severe")*

2050 Demands static across scenarios

- Decreasing Average Precipitation
- Increasing Precipitation Intensity
- Increasing Sea Level Rise
- Decreasing Semitropic Deliveries

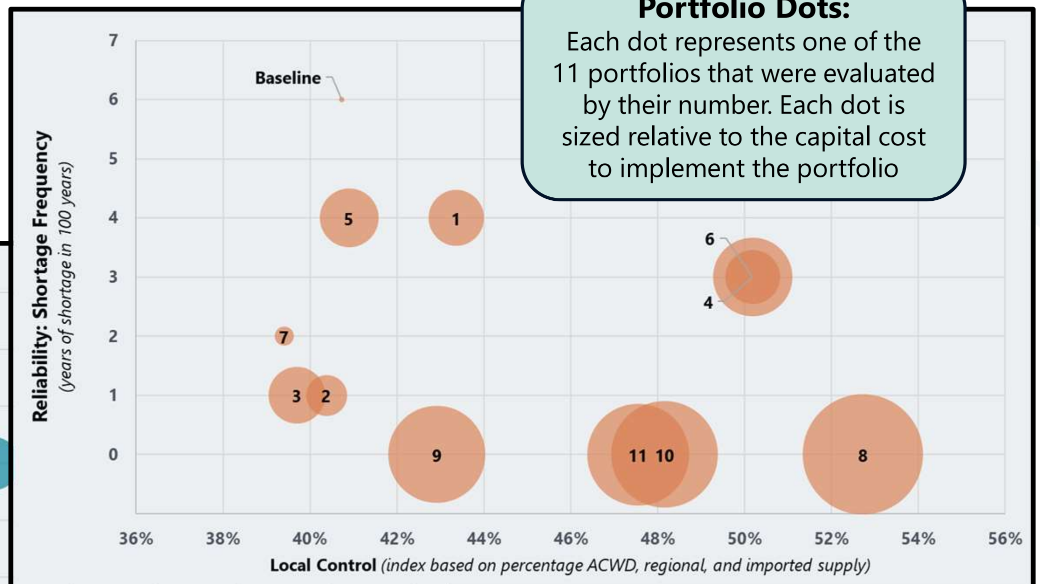
San Luis Reservoir (SWP Carryover) | No San Luis Reservoir (No SWP Carryover)

***Severe represents mid-range 2075 conditions as well as high severity climate change conditions in 2050.**

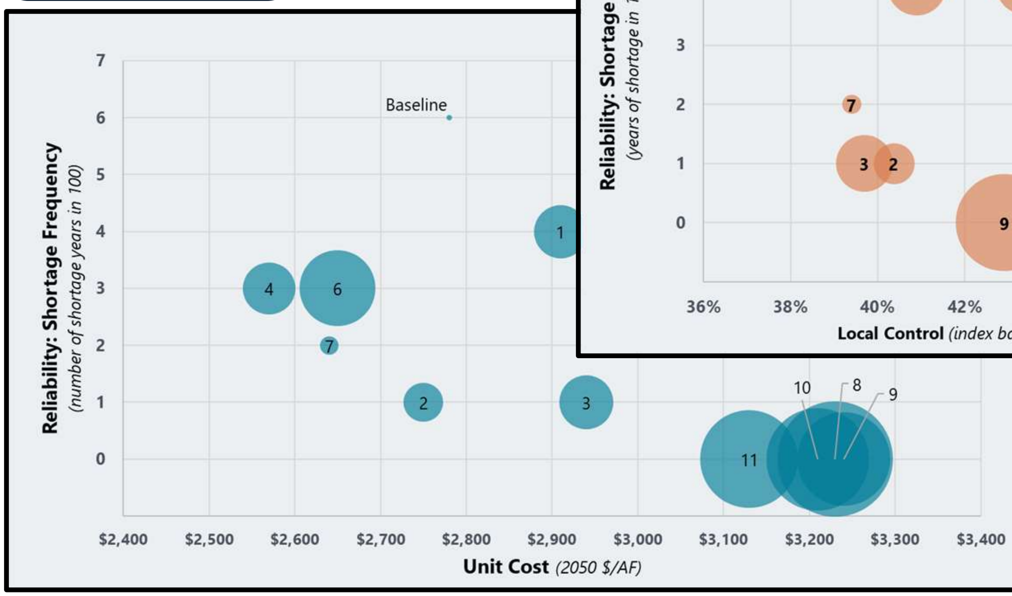
Guide to the following comparative analysis charts

Reliability Axis:
The number of years out of 100 when there is a shortage that exceeds 10%.

Portfolio Dots:
Each dot represents one of the 11 portfolios that were evaluated by their number. Each dot is sized relative to the capital cost to implement the portfolio



Local Control Axis:
An index of the weighted percentage of local, regional and imported supplies within each portfolio.

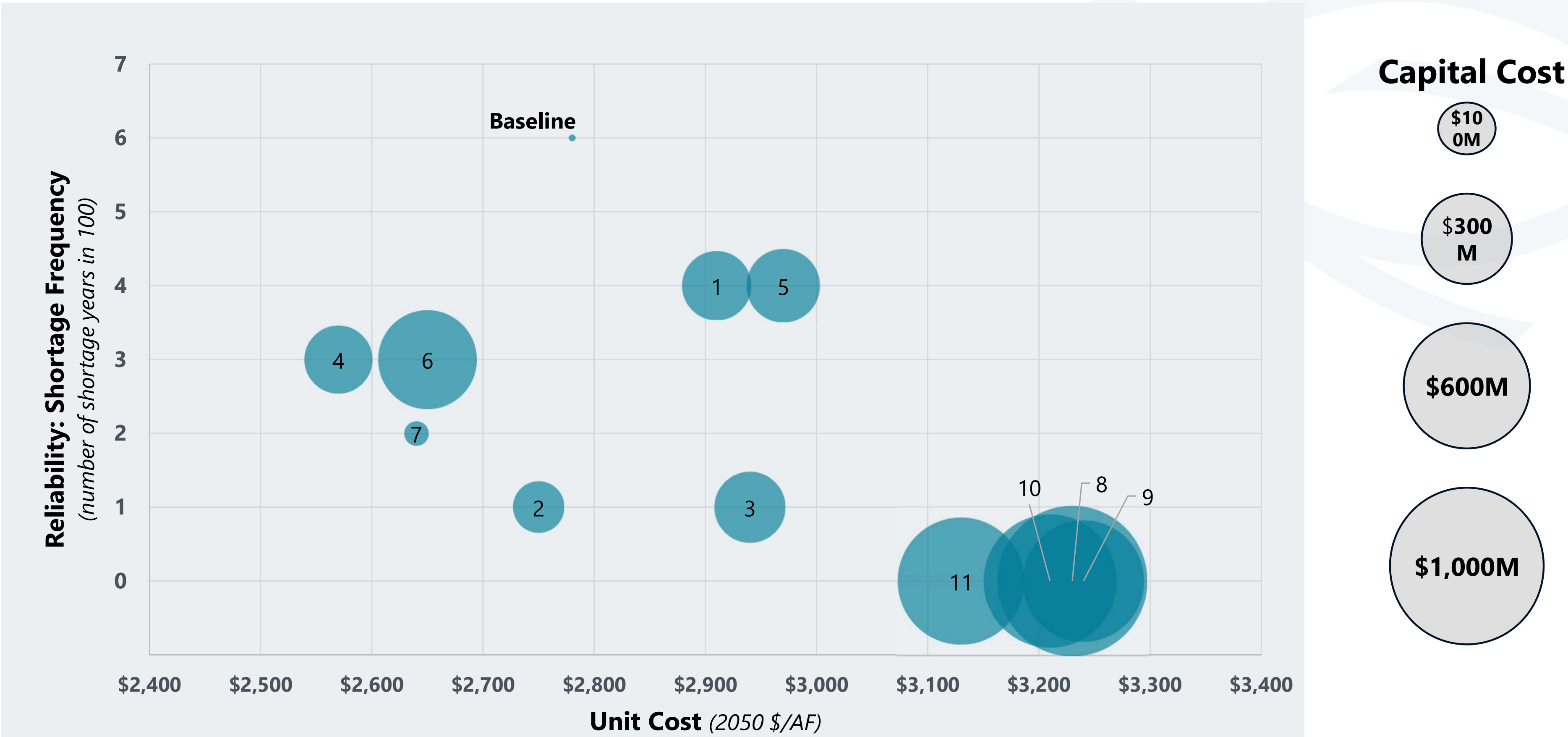


Unit Cost Axis:
The cost to produce the combined supplies within a portfolio in 2050 dollars.

For comparison, a recent blended unit production cost is $2,250/AF (2050 dollars)

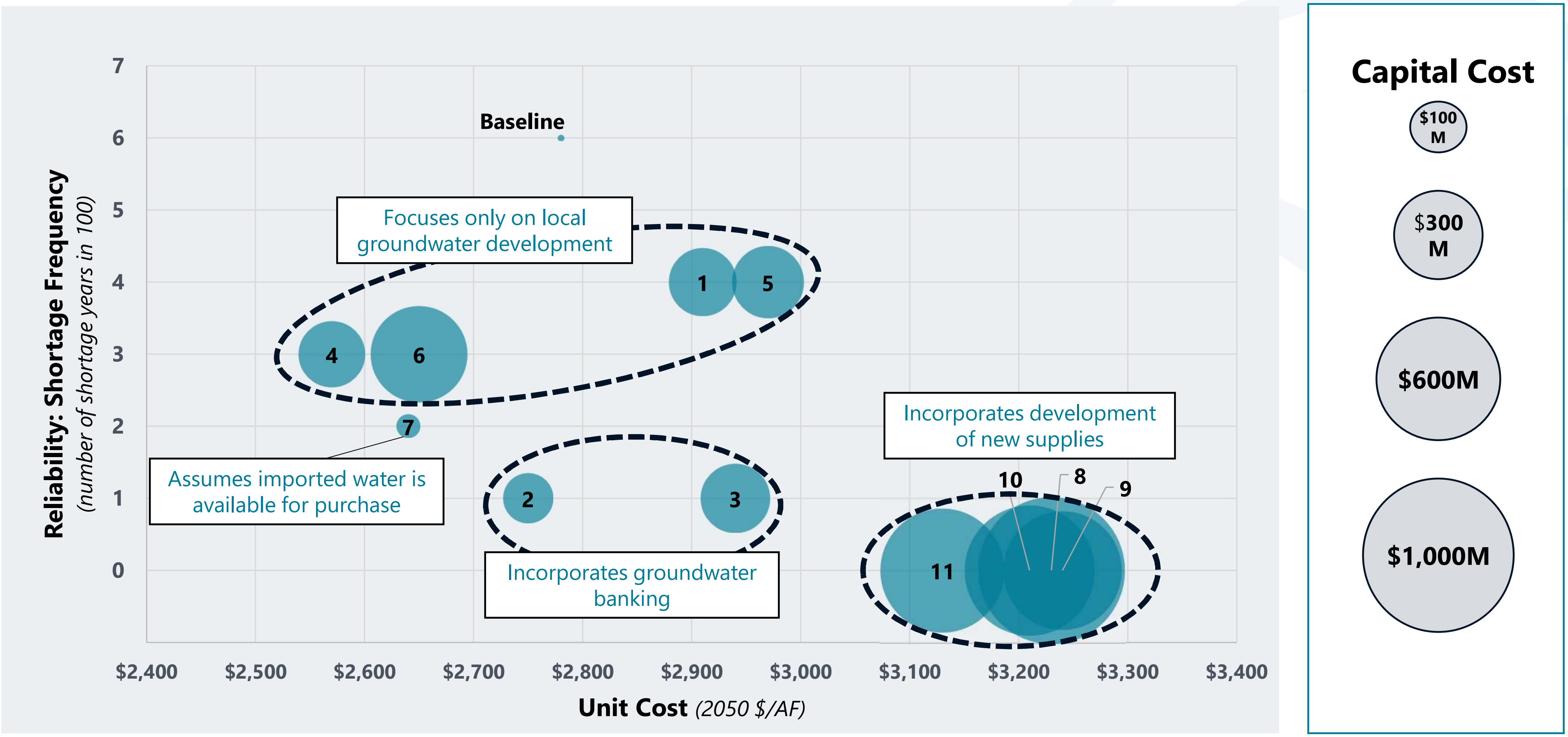
Scenario B Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-11)



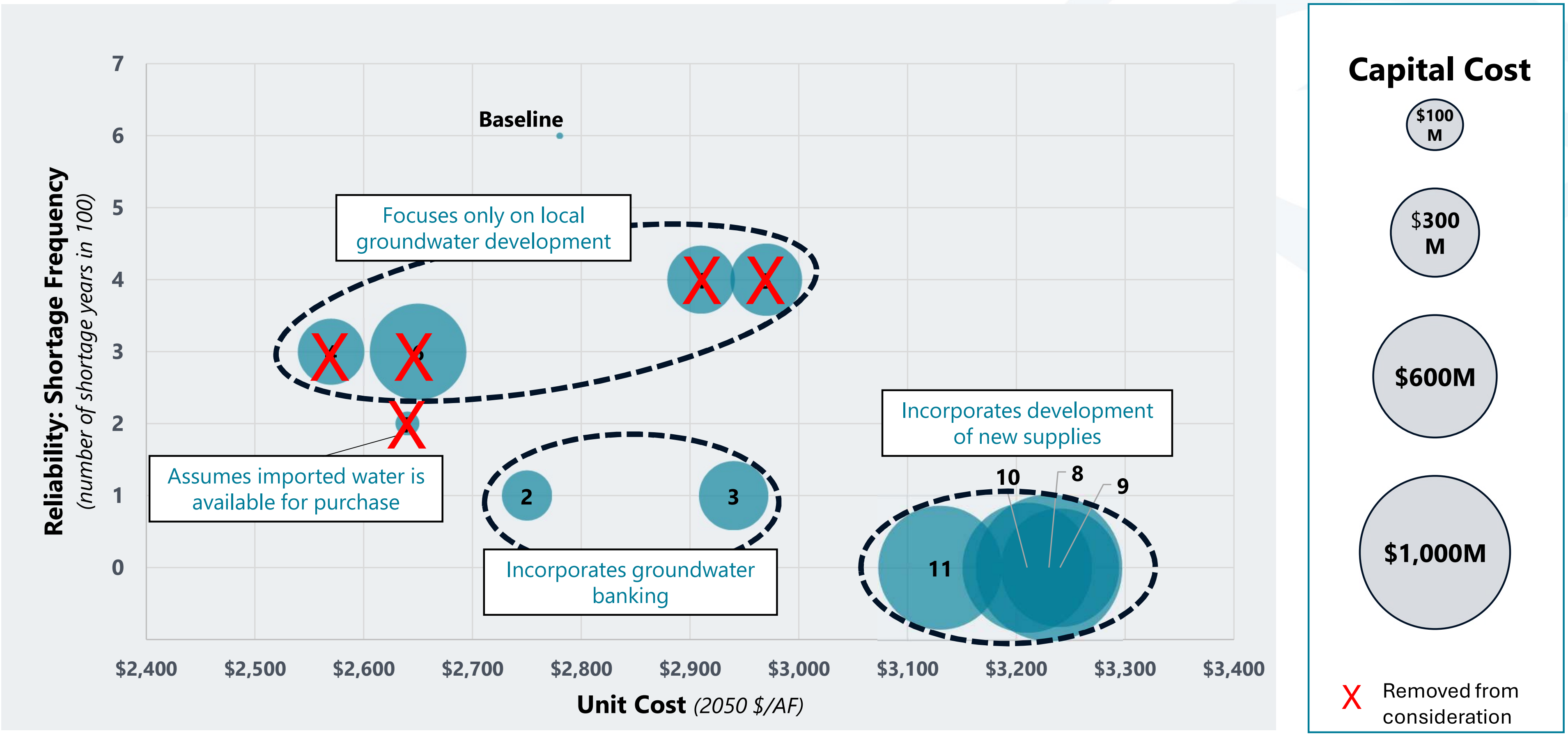
Scenario B Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-11)



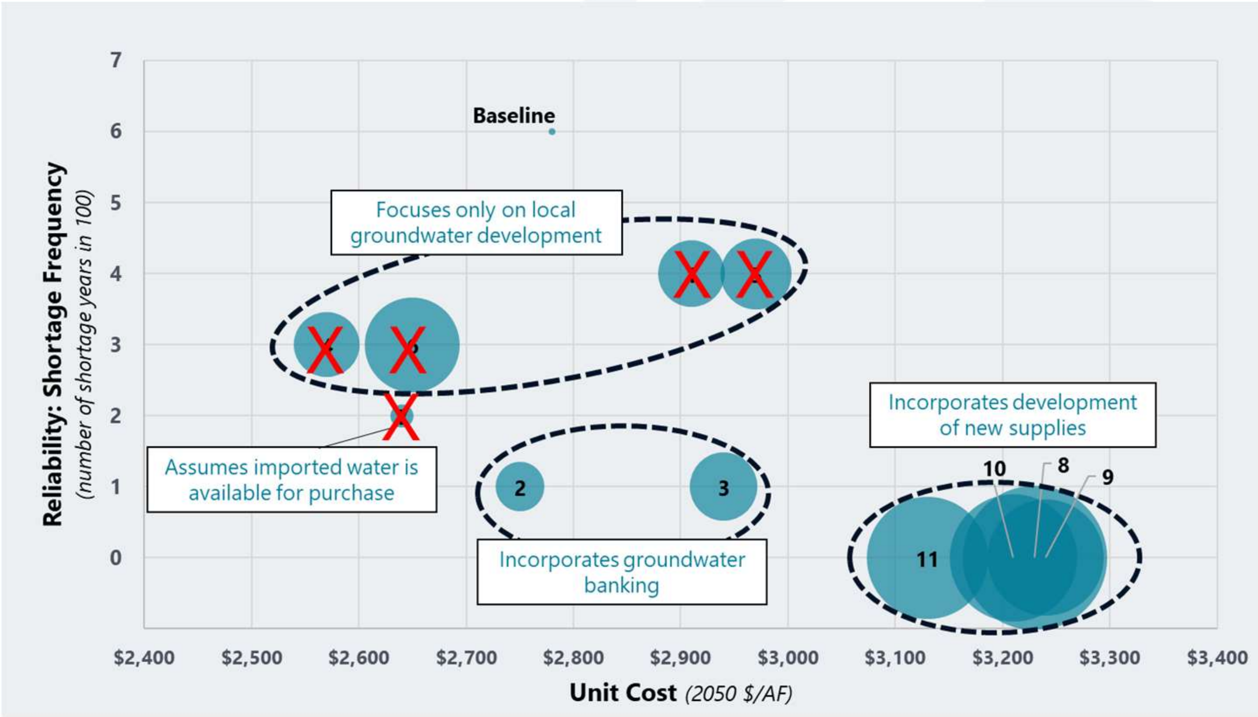
Scenario B Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-11)



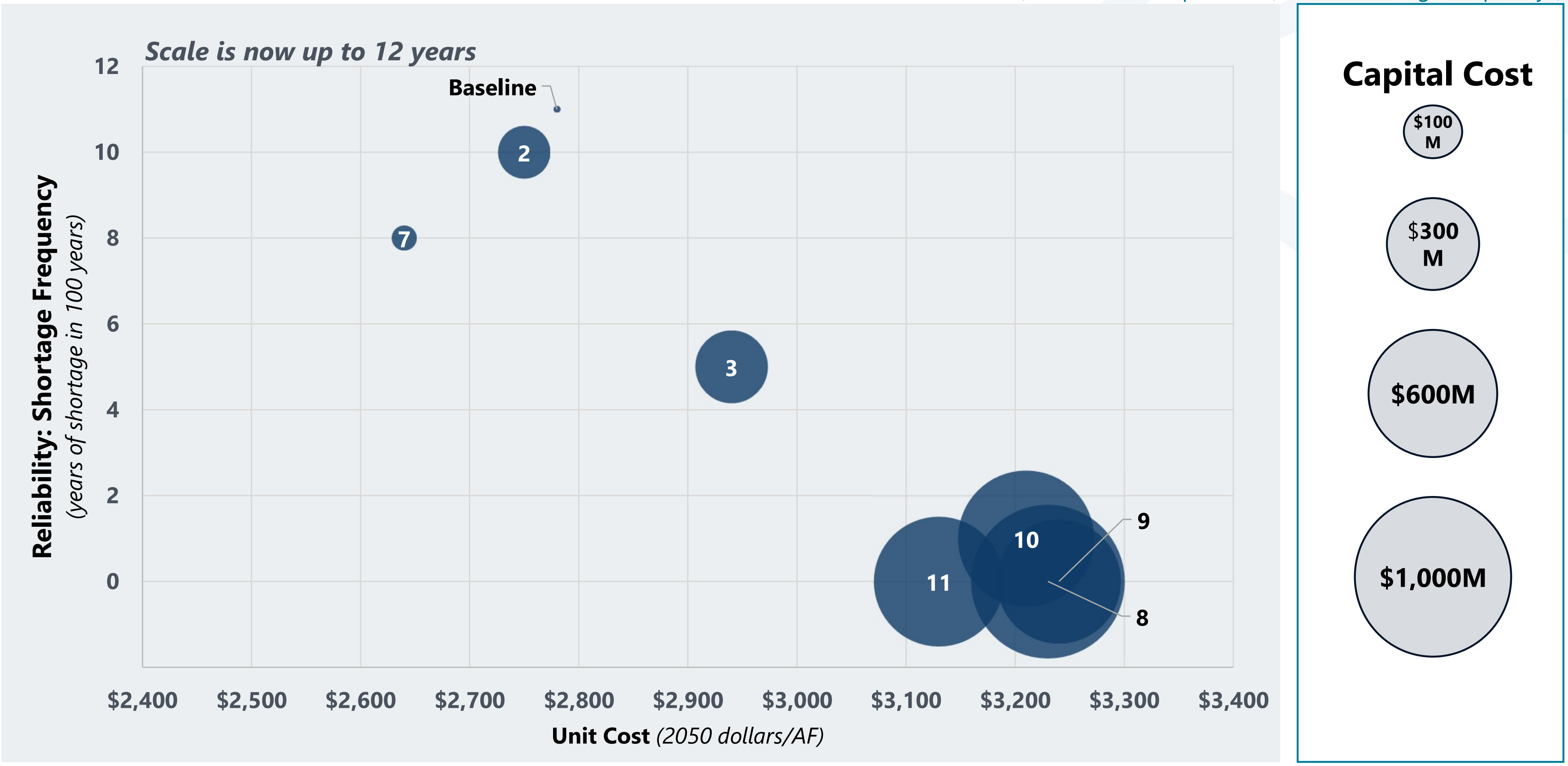
Scenario B Reliability vs. Cost

- **Key Takeaways**
  - Several portfolios adequately meet Board directed level of service thresholds
  - Increased banking/storage is a low capital cost way to improve reliability
  - Capital investments in new supplies will improve reliability in 2050 but at a higher cost



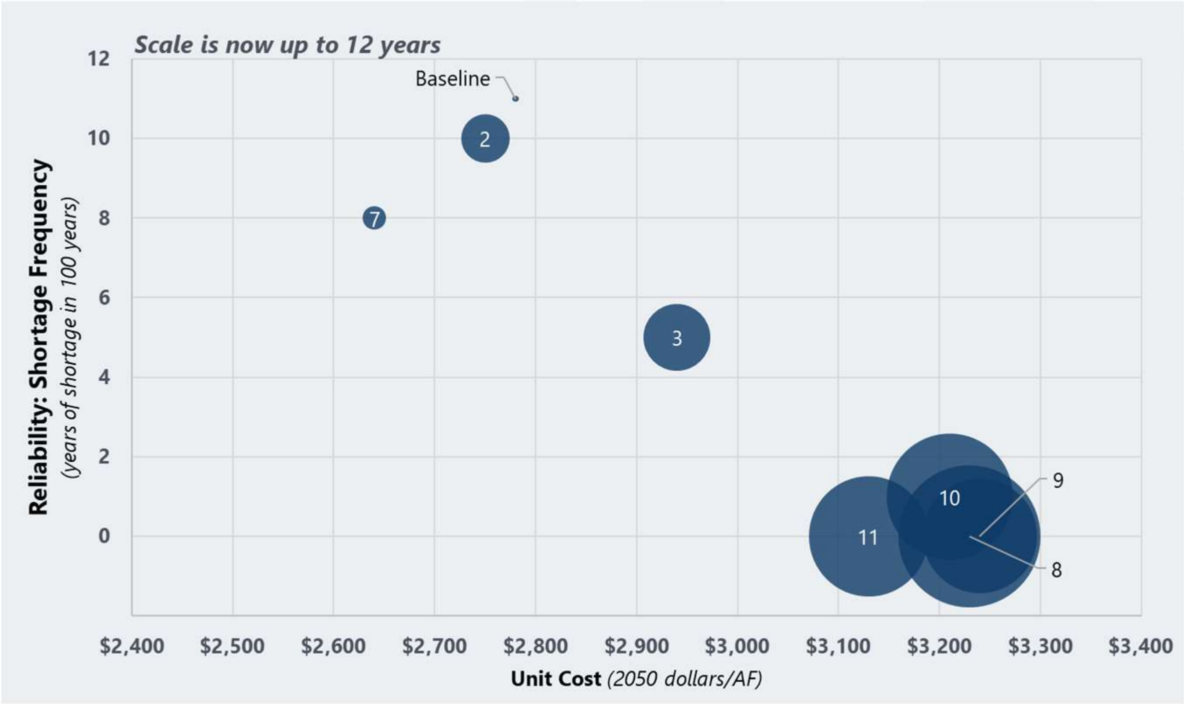
Scenario C Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-11)

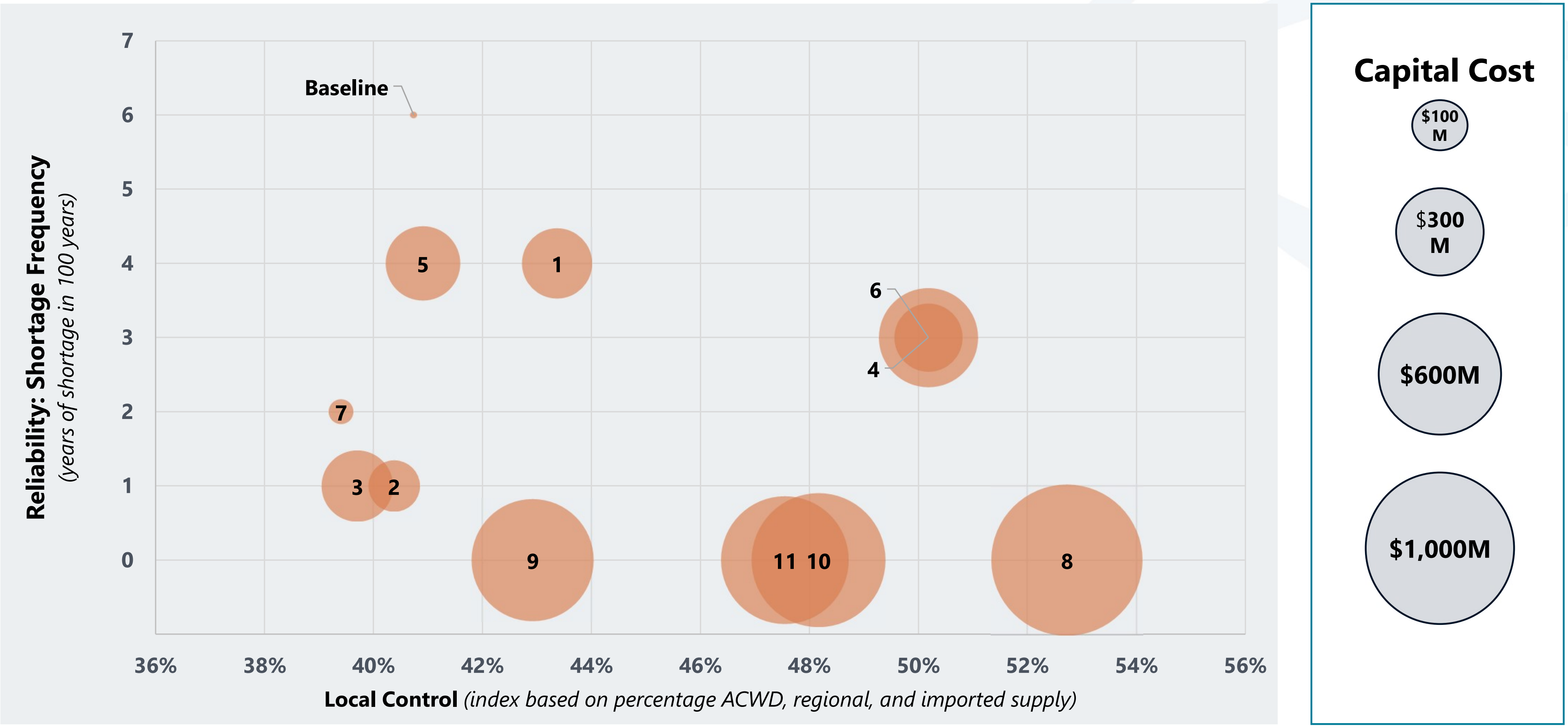


Scenario C Reliability vs. Cost

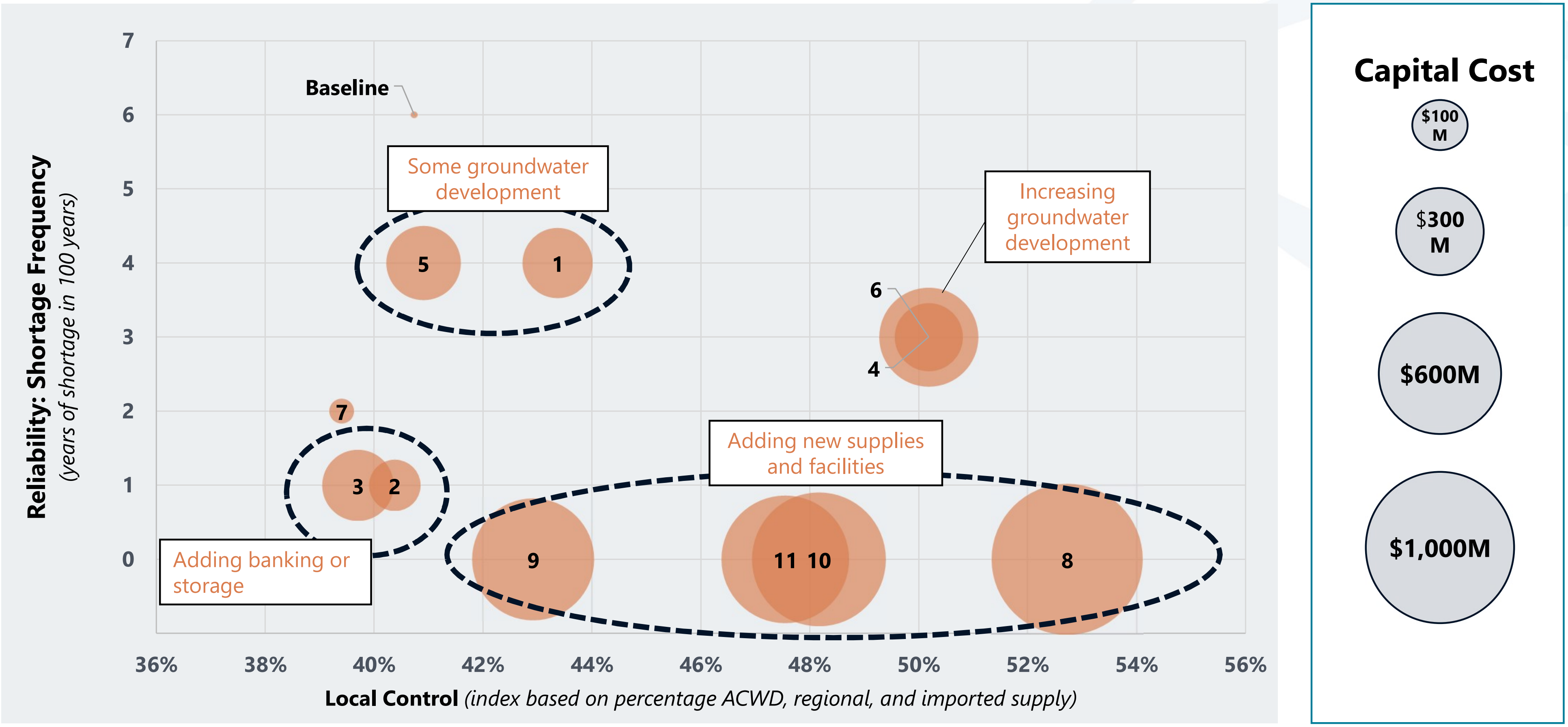
- **Key Takeaways**
  - Under moderate 2075 (or severe 2050) climate conditions, only those portfolios that generate a significant new supply will meet Board established reliability threshold goals.
  - A trade-off between cost and preparedness for longer-term future uncertainty emerges



Reliability (Scenario B) vs. Local Control

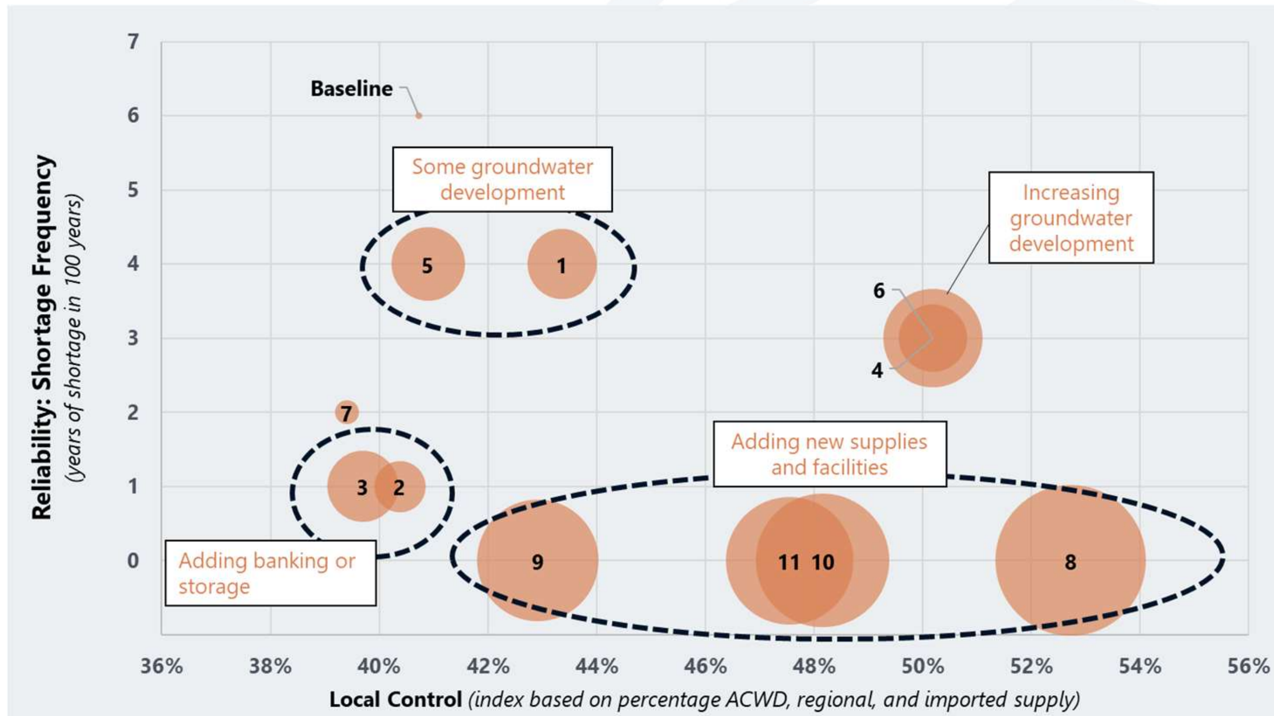


Reliability (Scenario B) vs. Local Control

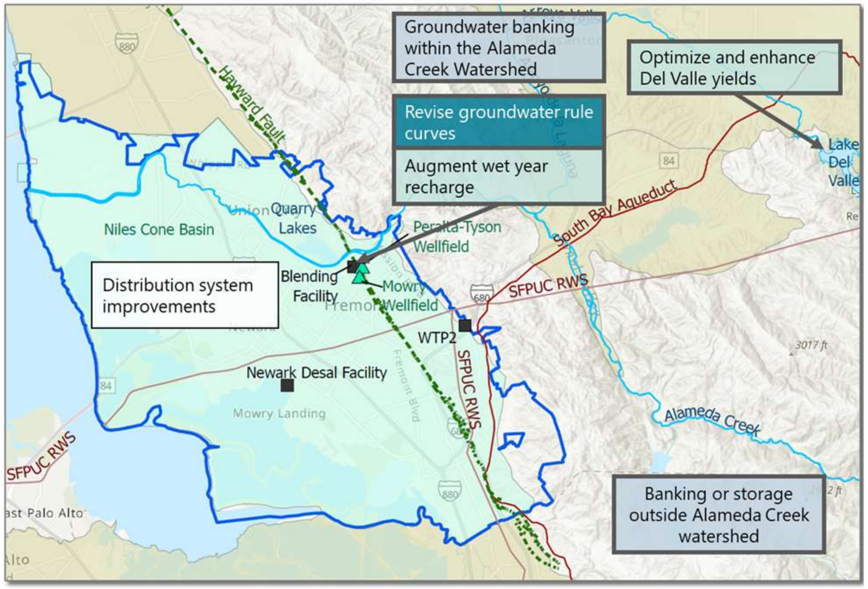


Reliability (Scenario B) vs. Local Control

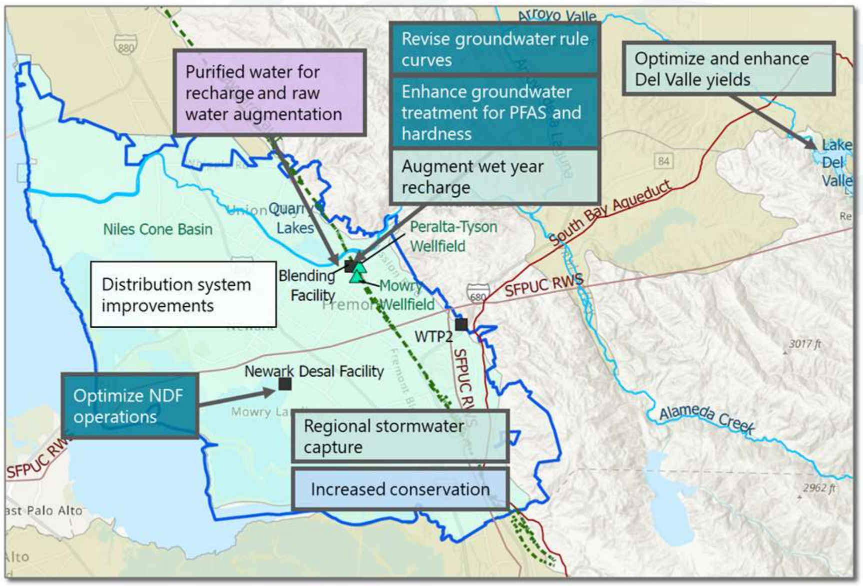
- **Key Takeaways**
  - The cost and reliability benefits of groundwater banking presents a tradeoff to having more local control
  - Due to limits on local groundwater supplies, portfolios without new regional supplies will be more dependent on imported water.
  - The new supply portfolios have a similar reliability, but with a range of local control
  - Focusing only on local supplies does not necessarily improve reliability



Portfolio 3 and 8 are solid options but present some key tradeoffs



Portfolio 3: Increase Local Reliance & Internal Banking
Increases longer-term reliability at the expense of local control.

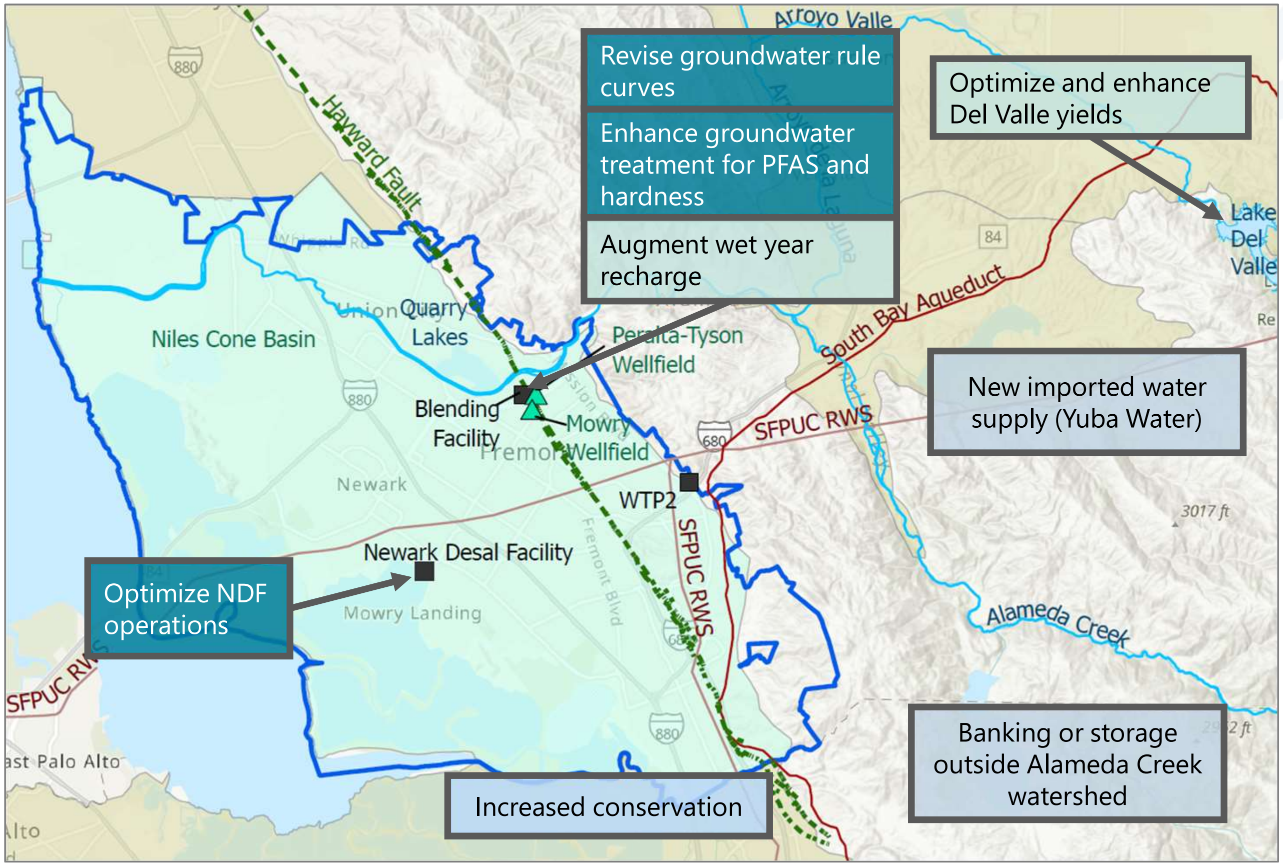


Portfolio 8: Increased Environmental Stewardship
Solidifies local control and reliability but requires a larger capital investment.

Creating a better portfolio:
A cost-effective, scalable reliability portfolio that addresses future risk

1. **Prioritize low- and no-regret investments that provide multiple benefits under today's conditions**
   Focus initial efforts on measures that perform well across a wide range of future scenarios while addressing multiple current needs.
2. **Layer in future interventions to address uncertainty while avoiding stranded assets**
   Later phases address uncertain future conditions by building on early investments rather than abandoning them.
3. **Establish a monitoring and trigger framework to guide costly future investments**
   A monitoring plan with trigger points guides the timing and scope of investments, ensuring costly steps are taken only when conditions warrant.
4. **Include flexible, adaptive pathways**
   Incorporate elements that can be adapted as circumstances evolve to support long-term resilience while maintaining scalability.

12A – Staff Recommendation, Phase 1



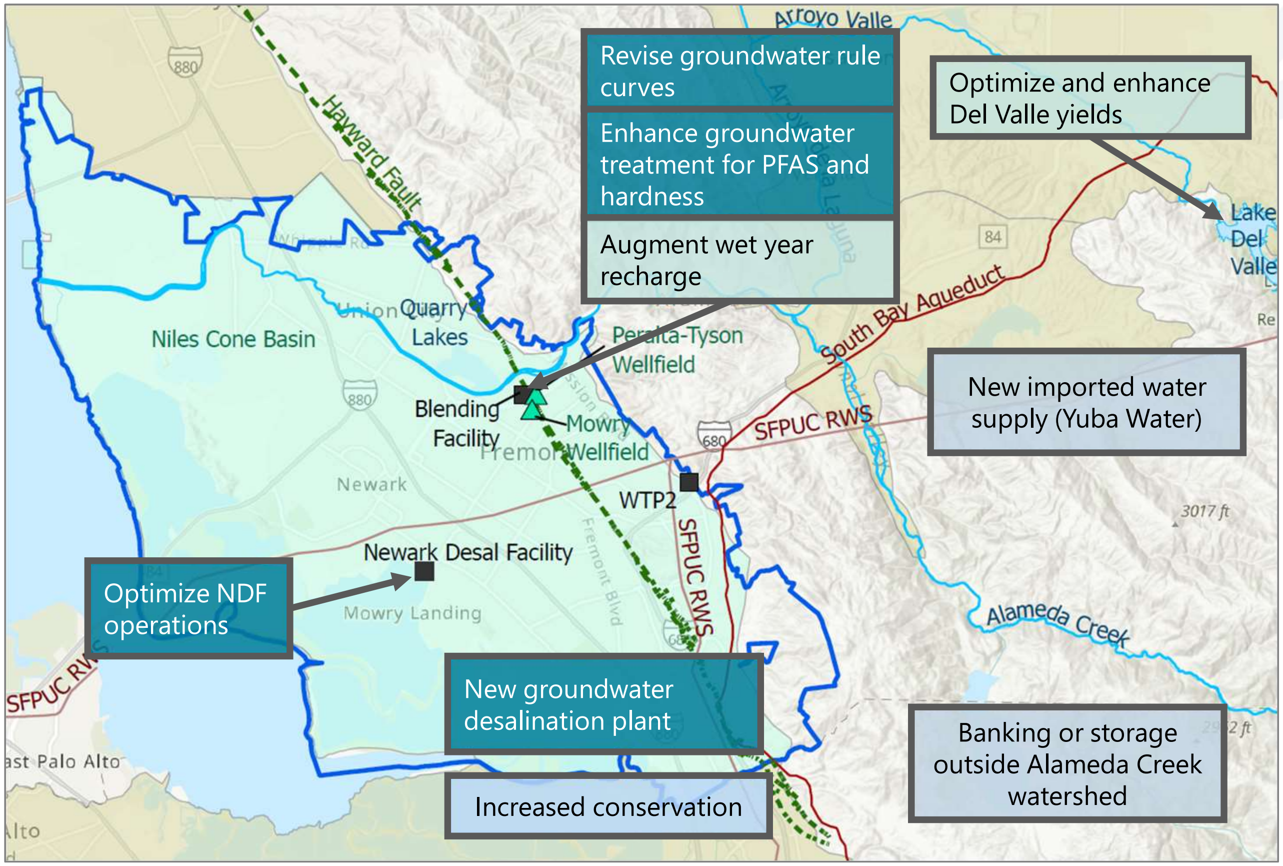
Capital Cost: $230M

Unit Cost: $2,800/AF

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

12B – Staff Recommendation, Phase 2



Capital Cost: $450M (+$220M)*

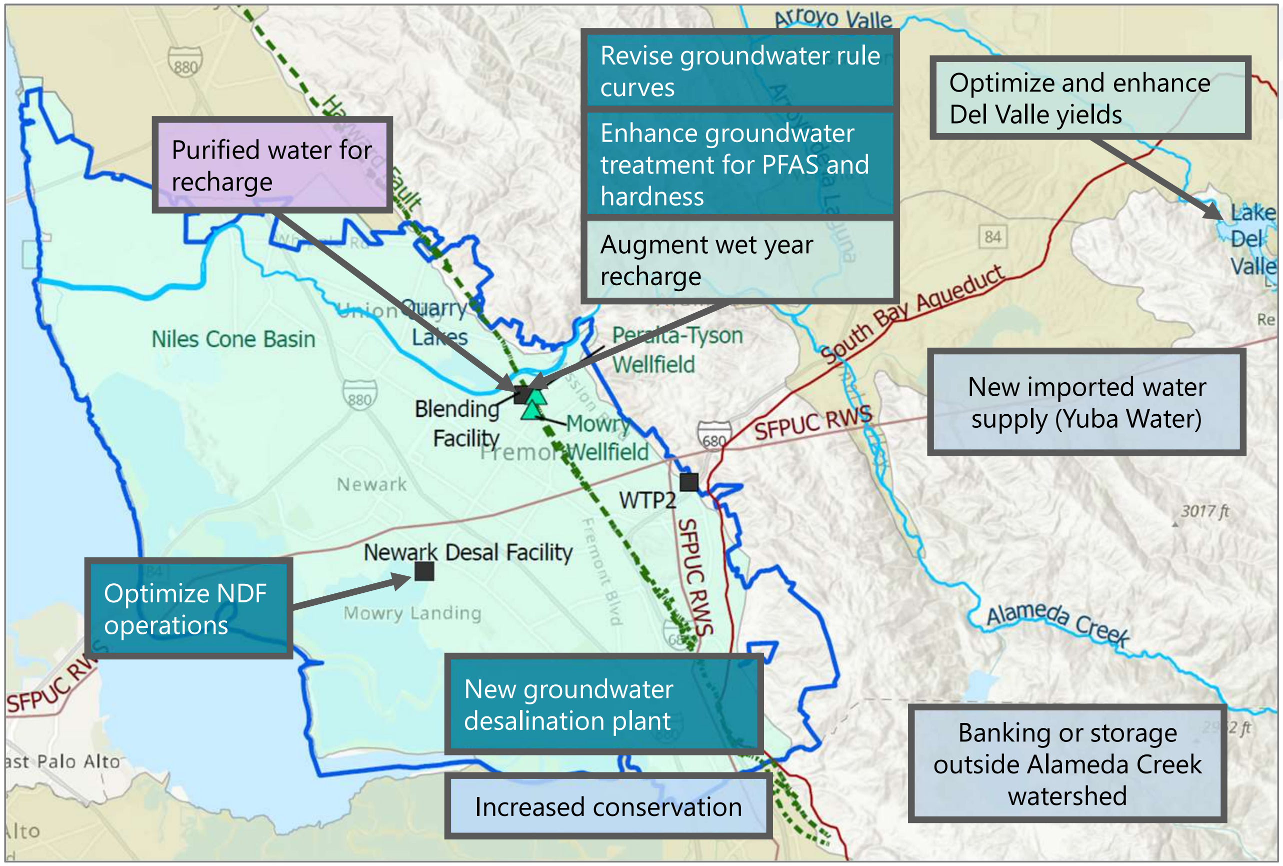
Unit Cost: $2,800/AF*

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

*Note that for 12A, 12B, and 12C, costs are cumulative
(so 12B includes the costs for 12A, 12C includes costs for 12A and 12B)

12C – Staff Recommendation, Phase 3



Capital Cost: $1,000M (+$550M)*

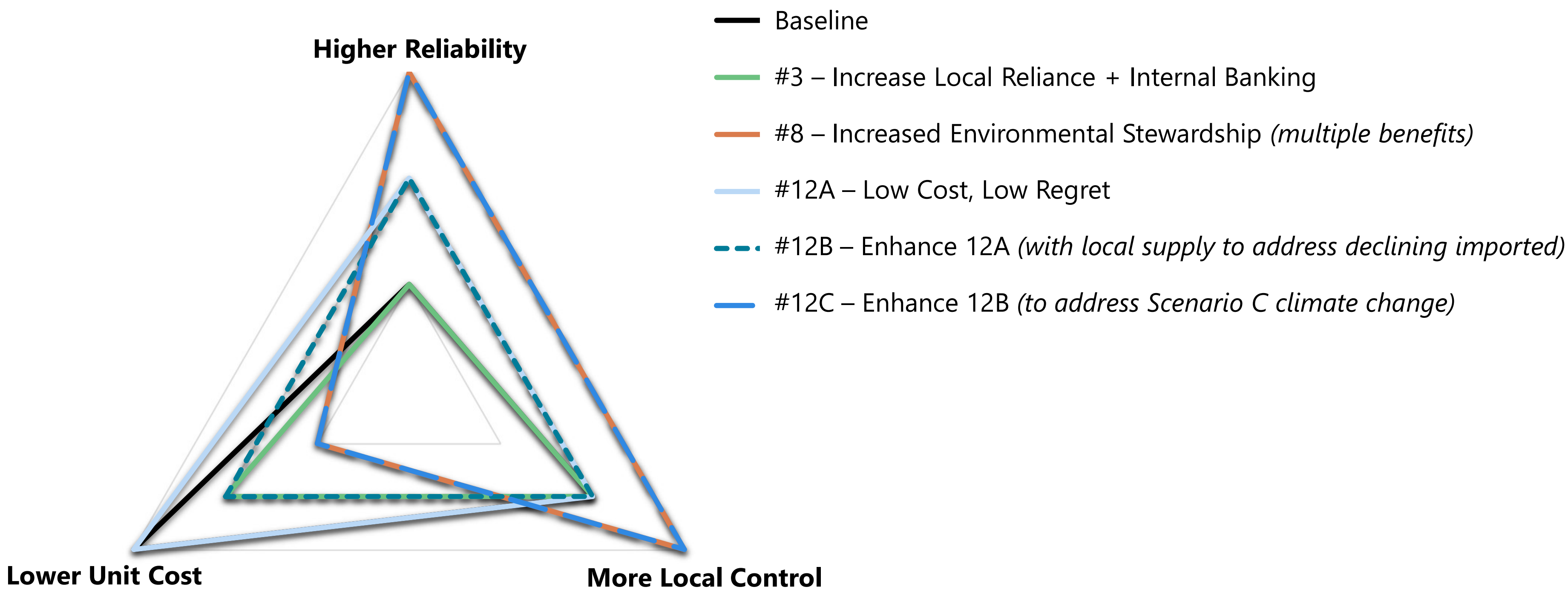
Unit Cost: $3,200/AF*

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

*Note that for 12A, 12B, and 12C, costs are cumulative
(so 12B includes the costs for 12A, 12C includes costs for 12A and 12B)

3 Criteria Comparative Analysis



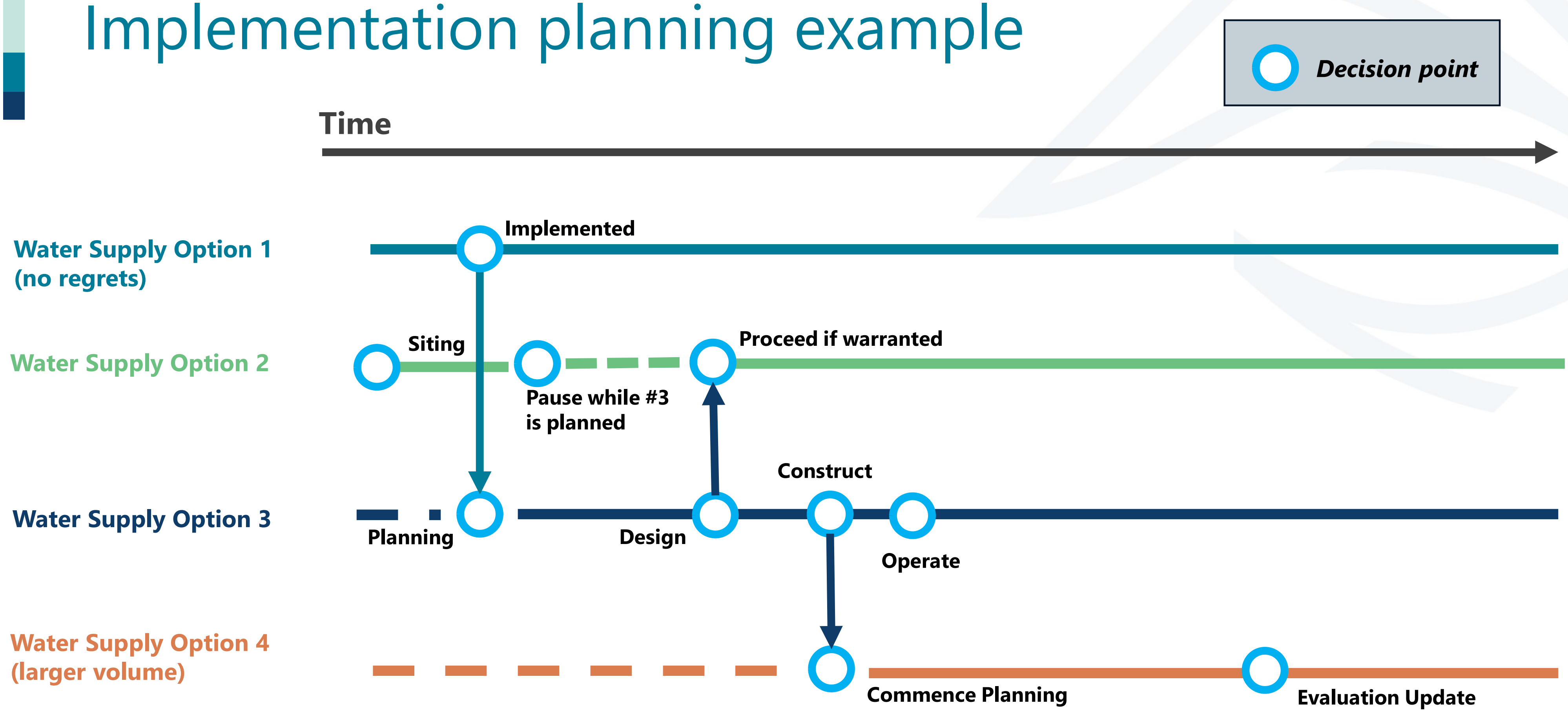
Discussion: Portfolio Selection

Questions for input

- Reliability vs cost trade-offs raises several questions:
  - For similar unit costs, is there a preference for operating costs over capital expenditures?
  - Higher reliability and higher cost portfolios have the advantage of addressing future conditions proactively – what is the Board's preference for such an approach versus a more incremental, monitor and adapt approach?
  - Is sufficient insight available as to the public's willingness to pay versus accept?
- A Board hypothesis was that local control and decreased regulatory risk would improve reliability. This appears to be the case though it comes with higher cost: to what degree should these attributes be weighed relative to cost?
- Decreasing the amount of SFPUC supply reduces operating costs, but then decreases the benefits of reliability/quality – what considerations come to mind?
- Are there other tradeoffs important to examine?

Preview: Implementation Planning

Implementation planning example



Discussion: Implementation Considerations

Questions to begin discussion

- The implementation analysis will consider:
  - Risk
  - Schedule requirements
  - Monitoring program and reporting
  - Triggers for decisions
  - Adaptability to future scenarios
- Are there other issues that should be considered?

Next Steps

Remaining planning process steps

WRMP Board workshops & topics

Topic	Anticipated Timing
✓ **Options & Strategies**	February 6, 2025
✓ **Portfolio Themes & Groupings**	May 29, 2025
✓ **Portfolio Evaluation & Selection**	August 28, 2025
Draft Water Resources Master Plan ***(focus on strategies and implementation)***	Nov 6, 2025

THANK YOU!

August 28, 2025

Handouts

Woodard & Curran

2050 WRMP Goals

What water resources future does ACWD want to achieve by 2050?

1. Sustainable water supply portfolio that leverages local resources and adapts to climate change
2. Affordable and equitable supply for all direct and indirect customers
3. Resilient and optimized water service infrastructure system and operations
4. Healthy watersheds and aquifers that are managed to provide multiple-benefits
5. Collaborative leadership to facilitate regional water management

2050 WRMP Planning Objectives

What does ACWD want to accomplish through the planning process?

1. Examine a **comprehensive list** of all potential supply projects and management strategies to select a **justifiable portfolio** that will best meet Water Resources Goals.
2. Address **future uncertainty and risk** through robust analysis.
3. Facilitate the making of **near-term tough decisions** and document the timing and **drivers for future decisions**.
4. Create an adaptive, dynamic, and feasible **implementation pathway**.
5. Identify and develop strategies that **align with funding opportunities**.
6. Encourage and facilitate **staff and Board involvement**, as well as diverse **public and potential collaborator engagement**.
7. **Educate public and customers** on ACWD's current and planned management of water resources.
8. **Support development of related planning efforts** such as ACWD's Engineering Report, UWMP, SGMA, and rate studies.

UWMP: Urban Water Management Plan
SGMA: Sustainable Groundwater Management Act

Evaluation Matrix: 11 portfolios

Evaluation Summary
August 28, 2025

Portfolios	Long Term Reliability (Scenario B): Frequency of shortage through modeling period	Long Term Reliability (Scenario B): Maximum Shortage Depth	Long Term Reliability (Scenario C): Frequency of shortage through modeling period.	Local Control: Summary Percent Local Control (weighted 100% local, 50% Regional)	Cost Efficiency (Unit Cost): Quantitative assessment based on unit cost.	Regulatory Risk (Operation): Based on operating permits required and additional regulatory coordination/reporting	Regulatory Risk (Construction): Qualitative assessment of the number and type of permits to construct/implement	Drinking Water Equity: Qualitative assessment of water quality (secondary)
Baseline	6 of 100 years	10700 AF	11 of 100 years	41%	$2780/AF ($0M Capital Cost)	0.0	No regulatory risk	Baseline use of Direct TO
#1 - Increase Local Reliance - Small Changes (GW Treatment)	4 of 100 years	9300 AF	8 of 100 years	43%	$2910/AF ($220M Capital Cost)	Typical operations permits similar to current ACWD permits	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline
#2 - Increase Local Reliance + External Banking	1 of 100 years	6900 AF	10 of 100 years	40%	$2750/AF ($120M Capital Cost)	Typical operations permits similar to current ACWD permits	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline
#3 - Increase Local Reliance + Internal Banking	1 of 100 years	7000 AF	5 of 100 years	40%	$2940/AF ($230M Capital Cost)	Typical operations permits similar to current ACWD permits with additional coordination of internal groundwater bank monitoring	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline
#4 - Increase Local Reliance - Medium Changes (GW Treatment & Optimization)	3 of 100 years	7100 AF	5 of 100 years	50%	$2570/AF ($210M Capital Cost)	Typical operations permits similar to current ACWD permits with additional permitting for an SFPUC intertie for NDF water	Low complication (common permitting, regulatory coordination)	Similar to baseline
#5 - Increase Local Reliance - Enhanced Southern Service Area	4 of 100 years	7100 AF	8 of 100 years	41%	$2970/AF ($240M Capital Cost)	Typical operations permits similar to current ACWD permits with additional coordination of internal groundwater bank monitoring	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline
#6 - Increase Local Reliance - Large Changes (GW Treatment, Optimization, & Desal)	3 of 100 years	7100 AF	5 of 100 years	50%	$2680/AF ($440M Capital Cost)	More complicated permitting due to increased treatment	Med complication (common permitting, but higher number of construction projects will require more permitting)	Similar to baseline
#7 - Improve Imported Water Supply Reliability	2 of 100 years	9400 AF	8 of 100 years	39%	$2640/AF ($30M Capital Cost)	Typical operations permits similar to current ACWD permits	High complication due to inclusion of new surface reservoir (significant permitting and reg coordination needed)	Less use of Direct TO than baseline
#8 - Increased Environmental Stewardship (Multiple Benefits)	0 of 100 years	0 AF	0 of 100 years	53%	$3230/AF ($1010M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Uses more water from Direct TO than baseline
#9 - Develop Local Drought-Resilient Supply (Desal)	0 of 100 years	0 AF	0 of 100 years	43%	$3240/AF ($660M Capital Cost)	Complicated regulatory coordination and permitting with Bay Desal plant.	High complication (less common permitting for new Bay desal plant plus significant regulatory coordination)	Less use of Direct TO than baseline
#10 - Develop Local Drought-Resilient Supply (Reuse-GW Recharge)	0 of 100 years	0 AF	1 of 100 years	48%	$3210/AF ($790M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Uses more water from Direct TO than baseline
#11 - Develop Local Drought-Resilient Supply (Reuse-Direct)	0 of 100 years	0 AF	0 of 100 years	48%	$3130/AF ($720M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Less use of Direct TO than baseline

Portfolios	Environmental Stewardship (energy use): Energy Intensity	Environmental Stewardship (other criteria): Qualitative based on other benefits: GW quality improvements and/or reduction in WW effluent	Regional Leadership: Qualitative assessment of level of regional benefits provided.	Leveraging Existing Resources (labor, capacity): Based on leveraging of existing labor and facility capacity	Community Benefits: expectation that jobs will be provided and/or community partnerships supported (stormwater, conservation projects)	Adaptability and Scalability: Infrastructure Resilience: Resilience of facilities	Adaptability and Scalability: Emergency Response: Ability to respond to supply outages (Delta outages)
Baseline	1000 kWh/AF	None	Low	No leveraging of facility capacity or current labor	None	No improvement in facility resilience	No improvement in ability to respond to emergencies
#1 - Increase Local Reliance - Small Changes (GW Treatment)	1300 kWh/AF	Provides groundwater quality improvements.	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little change to existing infrastructure except for distribution system improvements, some additional GW treatment.	Distribution system improvements but little local supply development
#2 - Increase Local Reliance + External Banking	1200 kWh/AF	Provides groundwater quality improvements.	Low	Low increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Distribution system improvements and increased ability to treat surface water (so can access more stored water if something happens to local supplies)	Distribution system improvements but little local supply development. Externally banked water may be difficult to access in a Delta outage.
#3 - Increase Local Reliance + Internal Banking	1300 kWh/AF	None	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction jobs	Little change to existing infrastructure except for distribution system improvements, some additional banking.	Distribution system improvements and local water bank would provide more resilience to Delta outage
#4 - Increase Local Reliance - Medium Changes (GW Treatment & Optimization)	1300 kWh/AF	Provides groundwater quality improvements.	Provides some regional benefit (SFPUC intertie)	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little change to existing infrastructure, some additional groundwater treatment (NDF, desal)	Distribution system improvements plus NDF optimization would improve resilience in a Delta outage.
#5 - Increase Local Reliance - Enhanced Southern Service Area	1300 kWh/AF	None	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Some additional facilities via distribution system improvements and access to southern portion basin	Distribution system improvements plus southern basin groundwater development and local water bank would improve resilience in a Delta outage.
#6 - Increase Local Reliance - Large Changes (GW Treatment, Optimization, & Desal)	1500 kWh/AF	Provides groundwater quality improvements.	Low	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Increased groundwater treatment and pumping plus distribution system improvements.	Distribution system improvements plus increased groundwater production from new groundwater desal plant would improve resilience in a Delta outage.
#7 - Improve Imported Water Supply Reliability	1200 kWh/AF	None	Low	Low increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little to no changes to infrastructure	No additional local supply development would make supplies vulnerable to a Delta outage.
#8 - Increased Environmental Stewardship (Multiple Benefits)	1600 kWh/AF	Provides groundwater quality improvements and reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs, and support community partnerships (stormwater, conservation programs)	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient
#9 - Develop Local Drought-Resilient Supply (Desal)	1800 kWh/AF	None	Provides regional benefit	Low increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction jobs	New treatment adjacent to coast may be vulnerable to SLR	Significant local supply development would provide reliable supplies during a Delta outage.
#10 - Develop Local Drought-Resilient Supply (Reuse-GW Recharge)	1300 kWh/AF	Reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient
#11 - Develop Local Drought-Resilient Supply (Reuse-Direct)	1200 kWh/AF	Reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient

Evaluation Matrix: 12 Portfolios

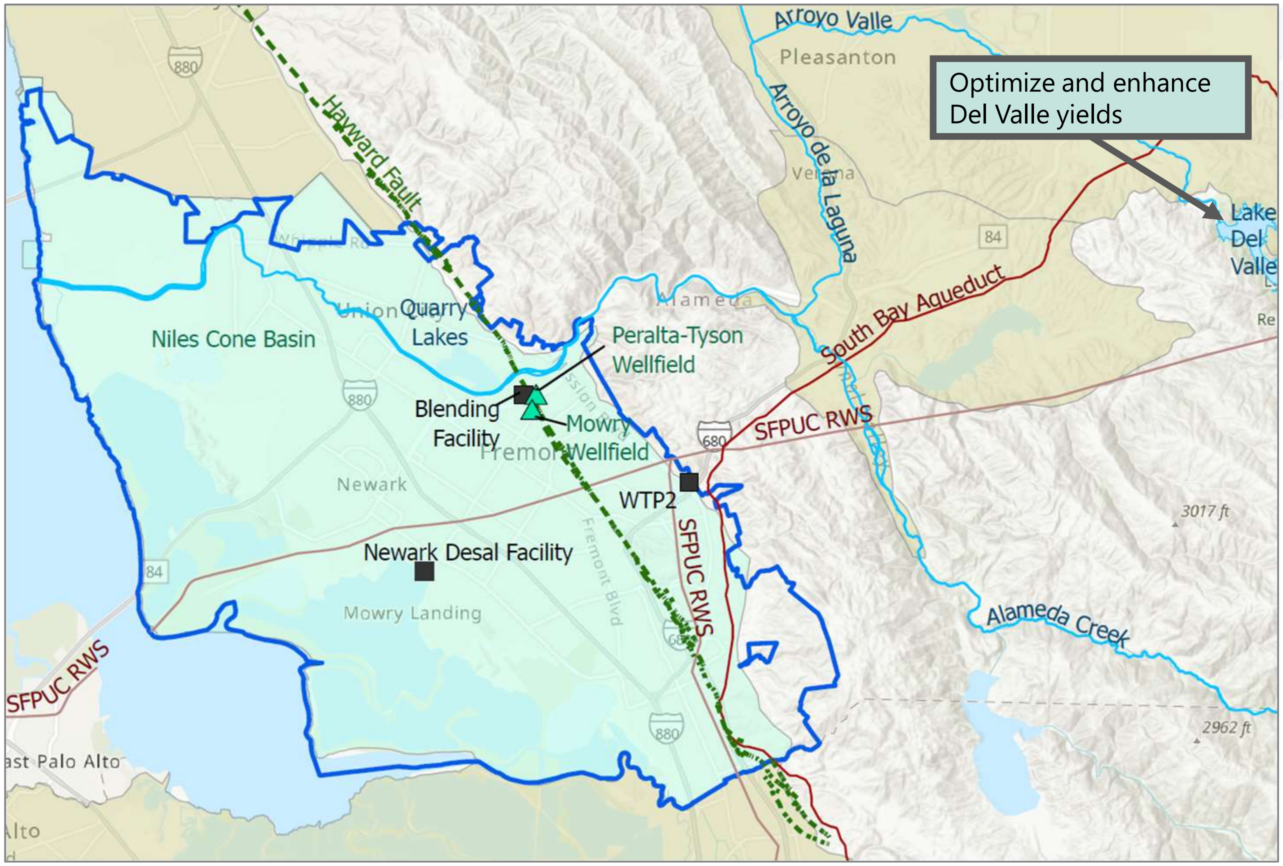
Evaluation Summary
August 28, 2025

	Long Term Reliability (Scenario B)		Long Term Reliability (Scenario C)	Local Control	Cost Efficiency (Unit Cost)	Regulatory Risk (Operation)	Regulatory Risk (Construction)	Drinking Water Equity	Environmental Stewardship (energy use)	Environmental Stewardship (other criteria)	Regional Leadership	Leveraging Existing Resources (labor, capacity)	Community Benefits	Adaptability and Scalability: Infrastructure Resilience	Adaptability and Scalability: Emergency Response
Portfolios	Frequency of shortage through modeling period	Maximum Shortage Depth	Frequency of shortage through modeling period.	Summary Percent Local Control (weighted 100% local, 50% Regional)	Quantitative assessment based on unit cost.	Based on operating permits required and additional regulatory coordination/reporting	Qualitative assessment of the number and type of permits to construct/implement	Qualitative assessment of water quality (secondary)	Energy Intensity	Qualitative based on other benefits: GW quality improvements and/or reduction in WW effluent	Qualitative assessment of level of regional benefits provided.	Based on leveraging of existing labor and facility capacity	expectation that jobs will be provided and/or community partnerships supported (stormwater, conservation projects)	Resilience of facilities	Ability to respond to supply outages (Delta outages)
Baseline	6 of 100 years	10700 AF	11 of 100 years	41%	$2780/AF ($0M Capital Cost)	0.0	No regulatory risk	Baseline use of Direct TO	1000 KWh/AF	None	Low	No leveraging of facility capacity or current labor	None	No improvement in facility resilience	No improvement in ability to respond to emergencies
#1 - Increase Local Reliance - Small Changes (GW Treatment)	4 of 100 years	9300 AF	8 of 100 years	43%	$2910/AF ($220M Capital Cost)	Typical operations permits similar to current ACWD permits	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1300 KWh/AF	Provides groundwater quality improvements.	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little change to existing infrastructure except for distribution system improvements, some additional GW treatment.	Distribution system improvements but little local supply development
#2 - Increase Local Reliance + External Banking	1 of 100 years	6900 AF	10 of 100 years	40%	$2750/AF ($120M Capital Cost)	Typical operations permits similar to current ACWD permits	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1200 KWh/AF	Provides groundwater quality improvements.	Low	Low increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Distribution system improvements and increased ability to treat surface water (so can access more stored water if something happens to local supplies)	Distribution system improvements but little local supply development. Externally banked water may be difficult to access in a Delta outage.
#3 - Increase Local Reliance + Internal Banking	1 of 100 years	7000 AF	5 of 100 years	40%	$2940/AF ($230M Capital Cost)	Typical operations permits similar to current ACWD permits with additional coordination of internal groundwater bank monitoring	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1300 KWh/AF	None	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction jobs	Little change to existing infrastructure except for distribution system improvements, some additional banking.	Distribution system improvements and local water bank would provide more resilience to Delta outage
#4 - Increase Local Reliance - Medium Changes (GW Treatment & Optimization)	3 of 100 years	7100 AF	5 of 100 years	50%	$2570/AF ($210M Capital Cost)	Typical operations permits similar to current ACWD permits with additional permitting for an SFPUC intertie for NDF water	Low complication (common permitting, regulatory coordination)	Similar to baseline	1300 KWh/AF	Provides groundwater quality improvements.	Provides some regional benefit (SFPUC intertie)	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little change to existing infrastructure, some additional groundwater treatment (NDF, desal)	Distribution system improvements plus NDF optimization would improve resilience in a Delta outage.
#5 - Increase Local Reliance - Enhanced Southern Service Area	4 of 100 years	7100 AF	8 of 100 years	41%	$2970/AF ($240M Capital Cost)	Typical operations permits similar to current ACWD permits with additional coordination of internal groundwater bank monitoring	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1300 KWh/AF	None	Low	Moderate increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Some additional facilities via distribution system improvements and access to southern portion basin	Distribution system improvements plus southern basin groundwater development and local water bank would improve resilience in a Delta outage.
#6 - Increase Local Reliance - Large Changes (GW Treatment, Optimization, & Desal)	3 of 100 years	7100 AF	5 of 100 years	50%	$2680/AF ($440M Capital Cost)	More complicated permitting due to increased treatment	Med complication (common permitting, but higher number of construction projects will require more permitting)	Similar to baseline	1500 KWh/AF	Provides groundwater quality improvements.	Low	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Increased groundwater treatment and pumping plus distribution system improvements.	Distribution system improvements plus increased groundwater production from new groundwater desal plant would improve resilience in a Delta outage.
#7 - Improve Imported Water Supply Reliability	2 of 100 years	9400 AF	6 of 100 years	39%	$2640/AF ($30M Capital Cost)	Typical operations permits similar to current ACWD permits	High complication due to inclusion of new surface reservoir (significant permitting and reg coordination needed)	Less use of Direct TO than baseline	1200 KWh/AF	None	Low	Low increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs	Little to no changes to infrastructure	No additional local supply development would make supplies vulnerable to a Delta outage.
#8 - Increased Environmental Stewardship (Multiple Benefits)	0 of 100 years	0 AF	0 of 100 years	53%	$3230/AF ($1010M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Uses more water from Direct TO than baseline	1600 KWh/AF	Provides groundwater quality improvements and reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs, and support community partnerships (stormwater, conservation programs)	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient
#9 - Develop Local Drought-Resilient Supply (Desal)	0 of 100 years	0 AF	0 of 100 years	43%	$3240/AF ($660M Capital Cost)	Complicated regulatory coordination and permitting with Bay Desal plant.	High complication (less common permitting for new Bay desal plant plus significant regulatory coordination)	Less use of Direct TO than baseline	1800 KWh/AF	None	Provides regional benefit	Low increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction jobs	New treatment adjacent to coast may be vulnerable to SLR	Significant local supply development would provide reliable supplies during a Delta outage.
#10 - Develop Local Drought-Resilient Supply (Reuse-GW Recharge)	0 of 100 years	0 AF	1 of 100 years	48%	$3210/AF ($790M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Uses more water from Direct TO than baseline	1300 KWh/AF	Reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient
#11 - Develop Local Drought-Resilient Supply (Reuse-Direct)	0 of 100 years	0 AF	0 of 100 years	48%	$3130/AF ($720M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Less use of Direct TO than baseline	1200 KWh/AF	Reduces effluent to Bay.	Provides regional benefit	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs	Several new infrastructure projects create redundancy	Significant local supply development but recycled water is not considered seismically resilient
#12A - Low Cost, Low Regret	0 of 100 years	0 AF	4 of 100 years	43%	$2790/AF ($230M Capital Cost)	Typical operations permits similar to current ACWD permits with additional coordination of internal groundwater bank monitoring	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1500 KWh/AF	Provides groundwater quality improvements.	Low	High increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs, and support community partnerships (conservation programs)	Distribution system improvements and increased ability to treat surface water (so can access more stored water if something happens to local supplies)	Distribution system improvements and local water bank would provide more resilience to Delta outage
#12B - Enhance12A with local option to address declining availability of imported supplies	0 of 100 years	0 AF	1 of 100 years	44%	$2640/AF ($450M Capital Cost)	More complicated permitting due to increased treatment	Low complication (common permitting, regulatory coordination)	Less use of Direct TO than baseline	1400 KWh/AF	Provides groundwater quality improvements.	Low	High increase in labor to manage supplies and leverages existing facility capacity	Expected to provide construction and operator jobs, and support community partnerships (conservation programs)	Distribution system improvements and increased ability to treat surface water (so can access more stored water if something happens to local supplies)	Distribution system improvements and local water bank would provide more resilience to Delta outage
#12C - Enhance12B to address Scenario C climate change	0 of 100 years	0 AF	0 of 100 years	47%	$3160/AF ($1030M Capital Cost)	More complicated permitting with addition of a recycled water system.	Med complication (common permitting, but higher number of construction projects will require more permitting)	Less use of Direct TO than baseline	1500 KWh/AF	Provides groundwater quality improvements and reduces effluent to Bay.	Low	High increase in labor to manage supplies and constructs significant new facilities	Expected to provide construction and operator jobs, and support community partnerships (conservation programs)	Several new infrastructure projects create redundancy	Significant local supply development would provide reliable supplies during a Delta outage.

Evaluation Matrix: Final Portfolios

Portfolio	Reliability B	Reliability C	Local Control	Cost Efficiency	Regulatory Risk	Regulatory Risk	Drinking Water Equity	Energy Use	Environmental Stewardship	Regional Leadership	Leveraging Existing Resources	Community Benefits	Infrastructure Resilience	Emergency Response
Baseline														
#3 - Increase Local Reliance + Internal Banking														
#8 - Increased Environmental Stewardship ***(multiple benefits)***														
#12A - Low Cost, Low Regret														
#12B - Enhance12A ***(with local supply to address declining imported)***														
#12C - Enhance12B ***(to address Scenario C climate change)***														

Baseline Portfolio



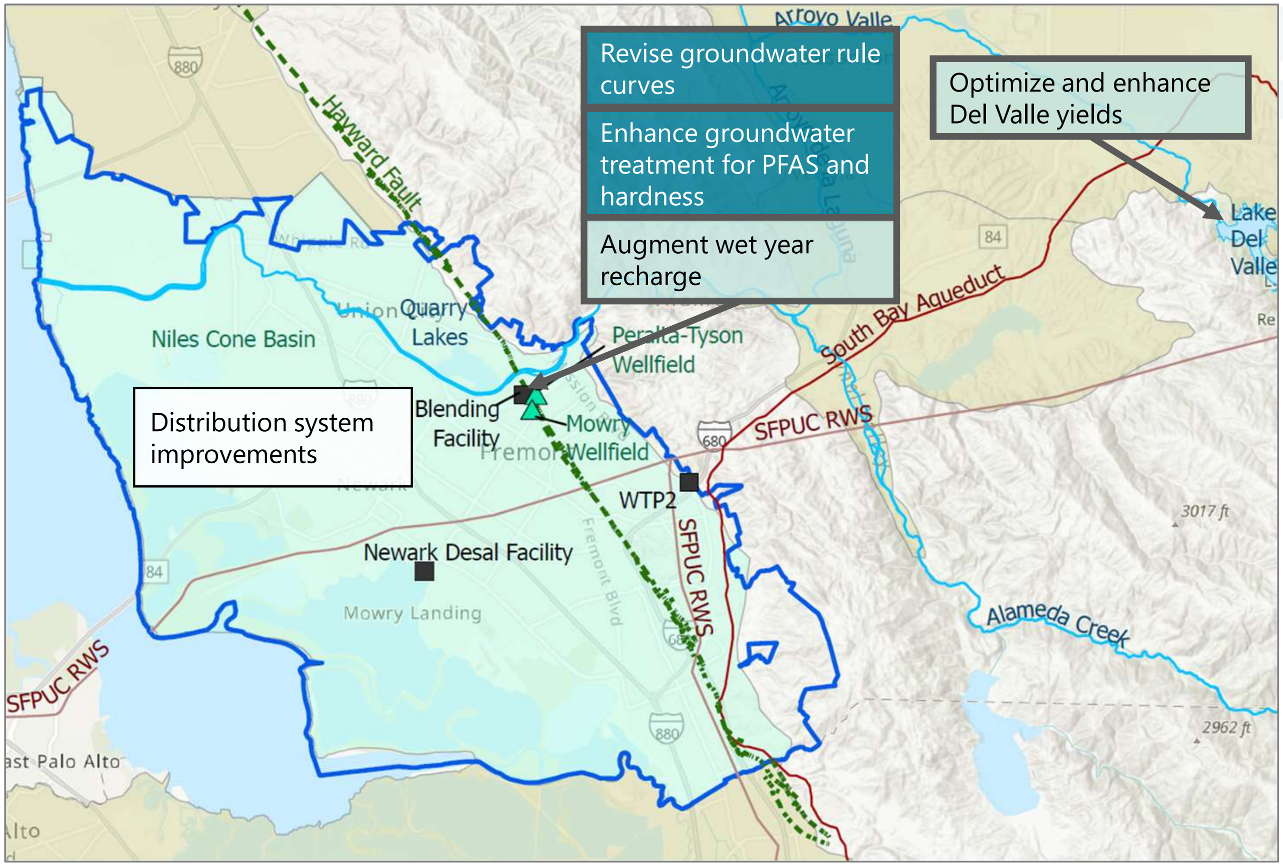
Capital Cost: $0

Unit Cost: $2,800/AF

Shortage Frequency: 6 in 100 years

Maximum Annual Shortage: 11,000 AF

1 - Increase Local Reliance - Small Changes (GW Treatment)



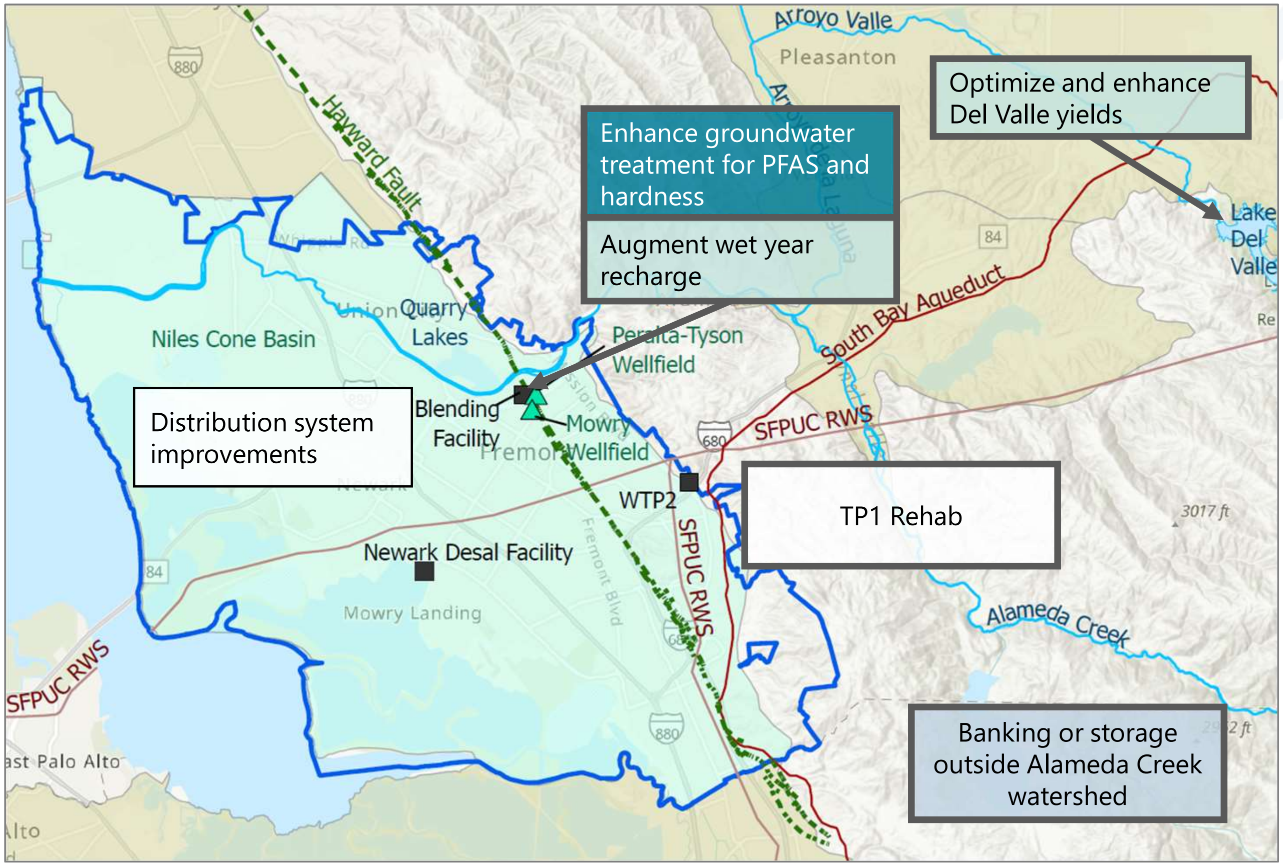
Capital Cost: $220M

Unit Cost: $2,900/AF

Shortage Frequency: 4 in 100 years

Maximum Annual Shortage: 9,000 AF

2 - Increase Local Reliance + External Banking



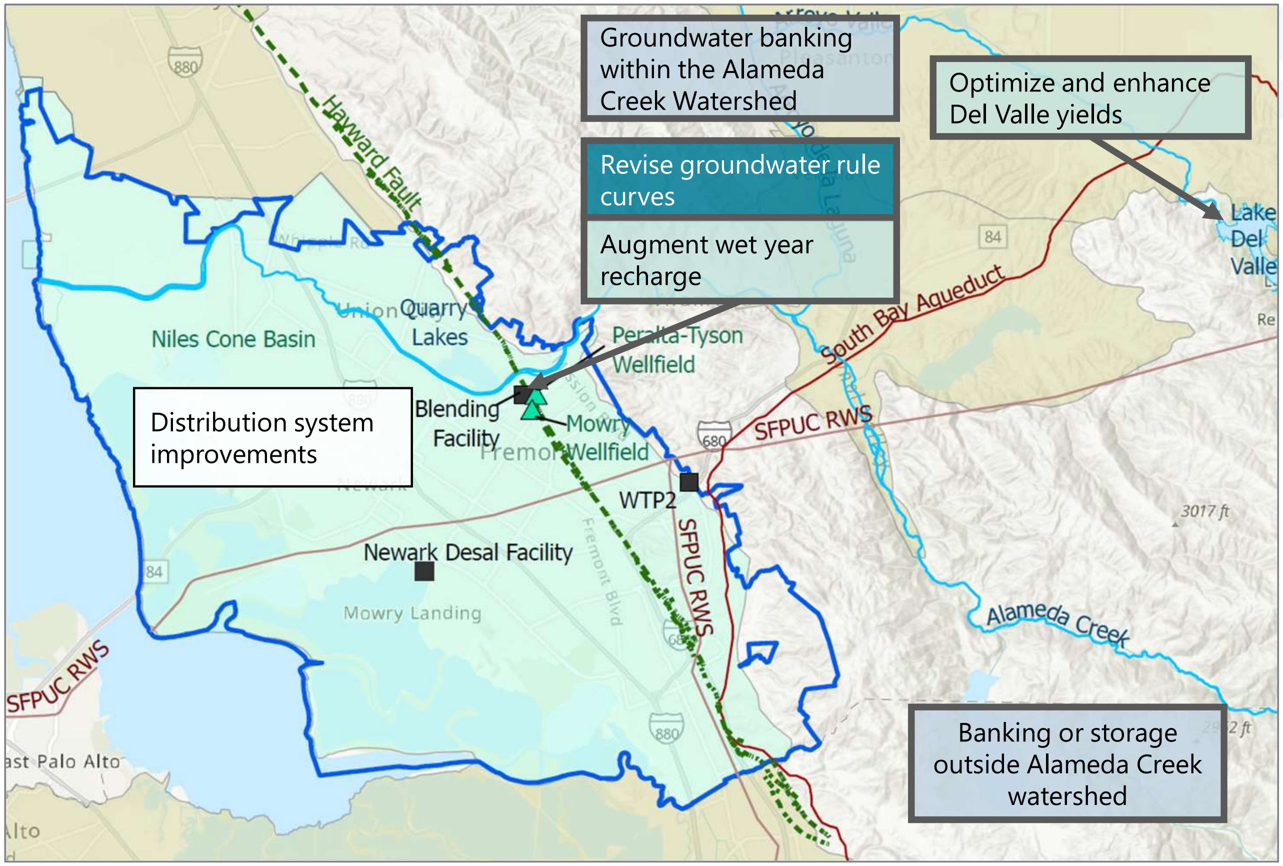
Capital Cost: $120M

Unit Cost: $2,800/AF

Shortage Frequency: 1 in 100 years

Maximum Annual Shortage: 7,000 AF

3 - Increase Local Reliance + Internal Banking



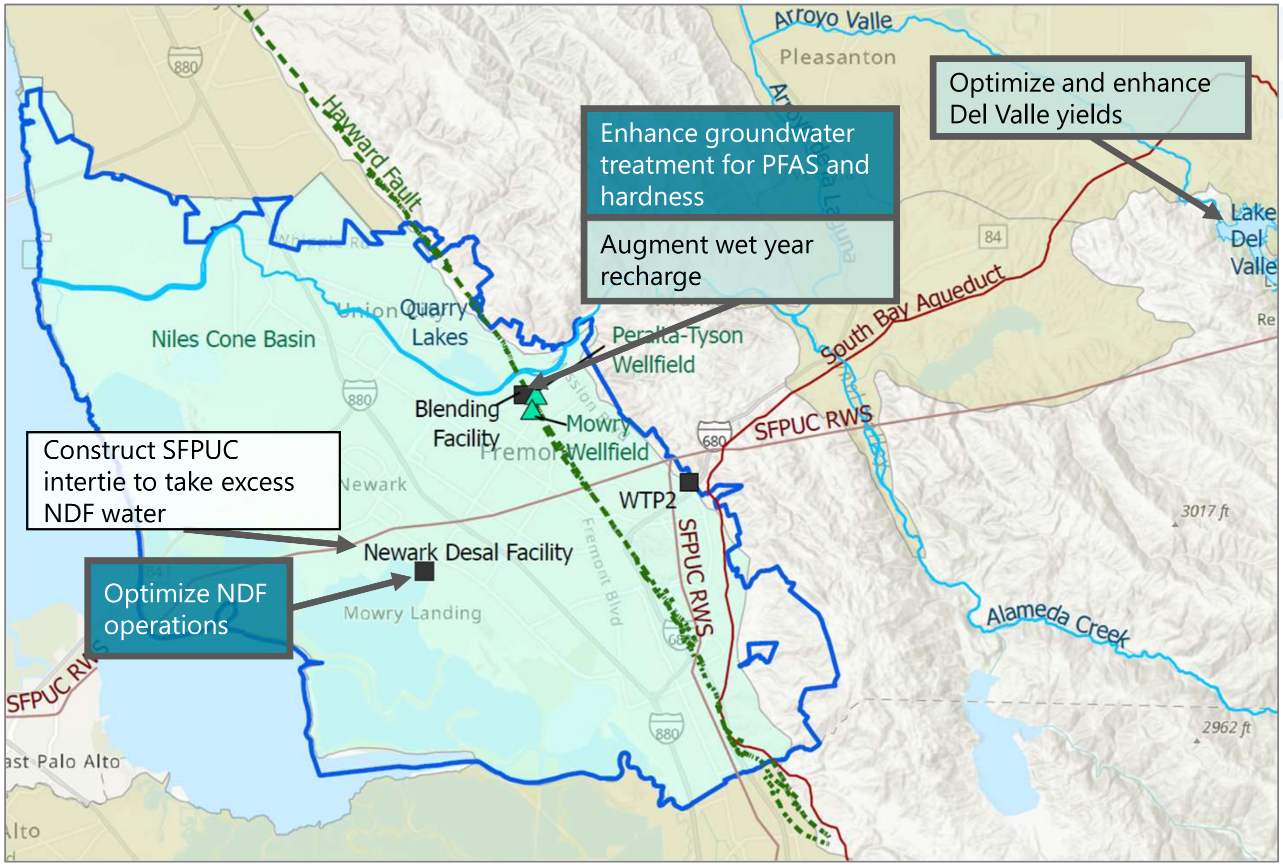
Capital Cost: $230M

Unit Cost: $2,900/AF

Shortage Frequency: 1 in 100 years

Maximum Annual Shortage: 7,000 AF

4 - Increase Local Reliance - Medium Changes (GW Treatment & Optimization)



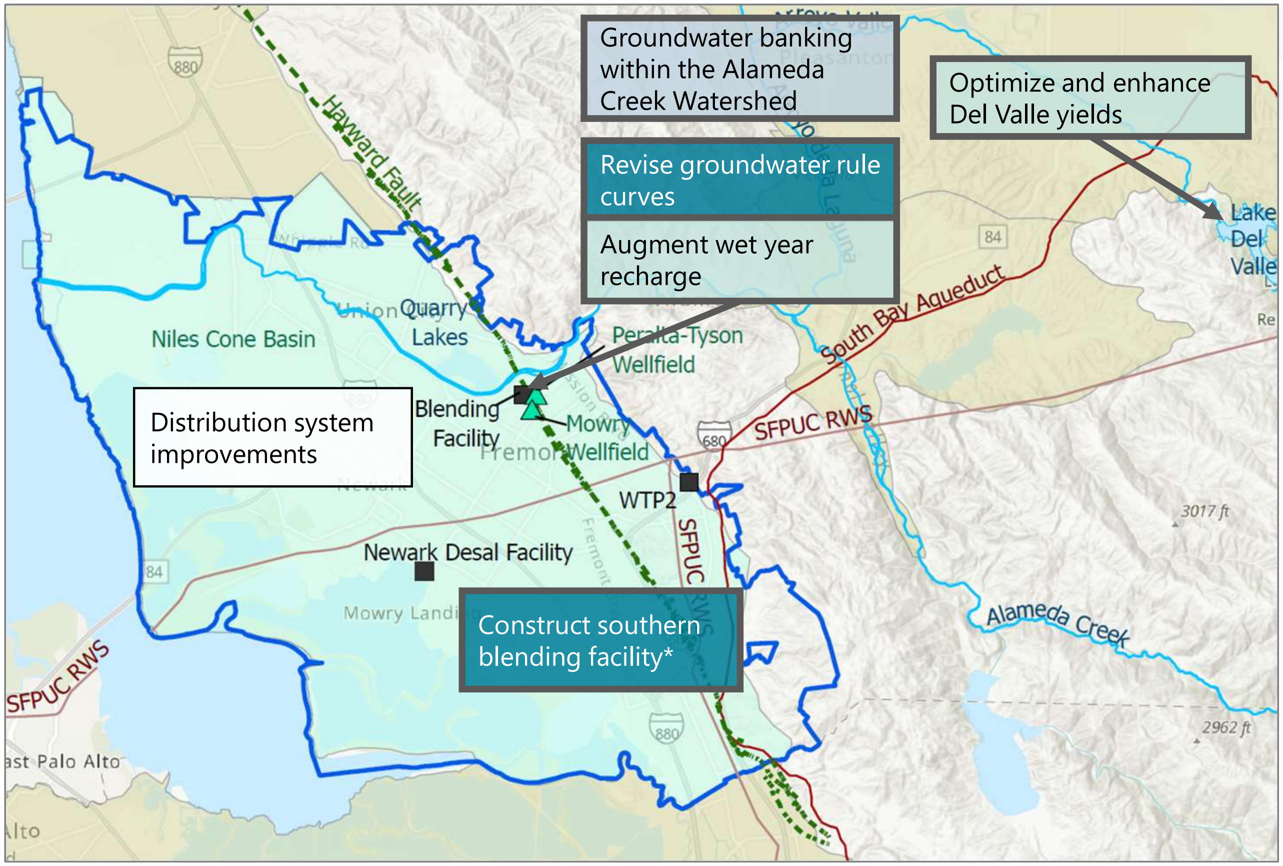
Capital Cost: $210M

Unit Cost: $2,600/AF

Shortage Frequency: 3 in 100 years

Maximum Annual Shortage: 7,000 AF

5 - Increase Local Reliance - Enhanced Southern Service Area



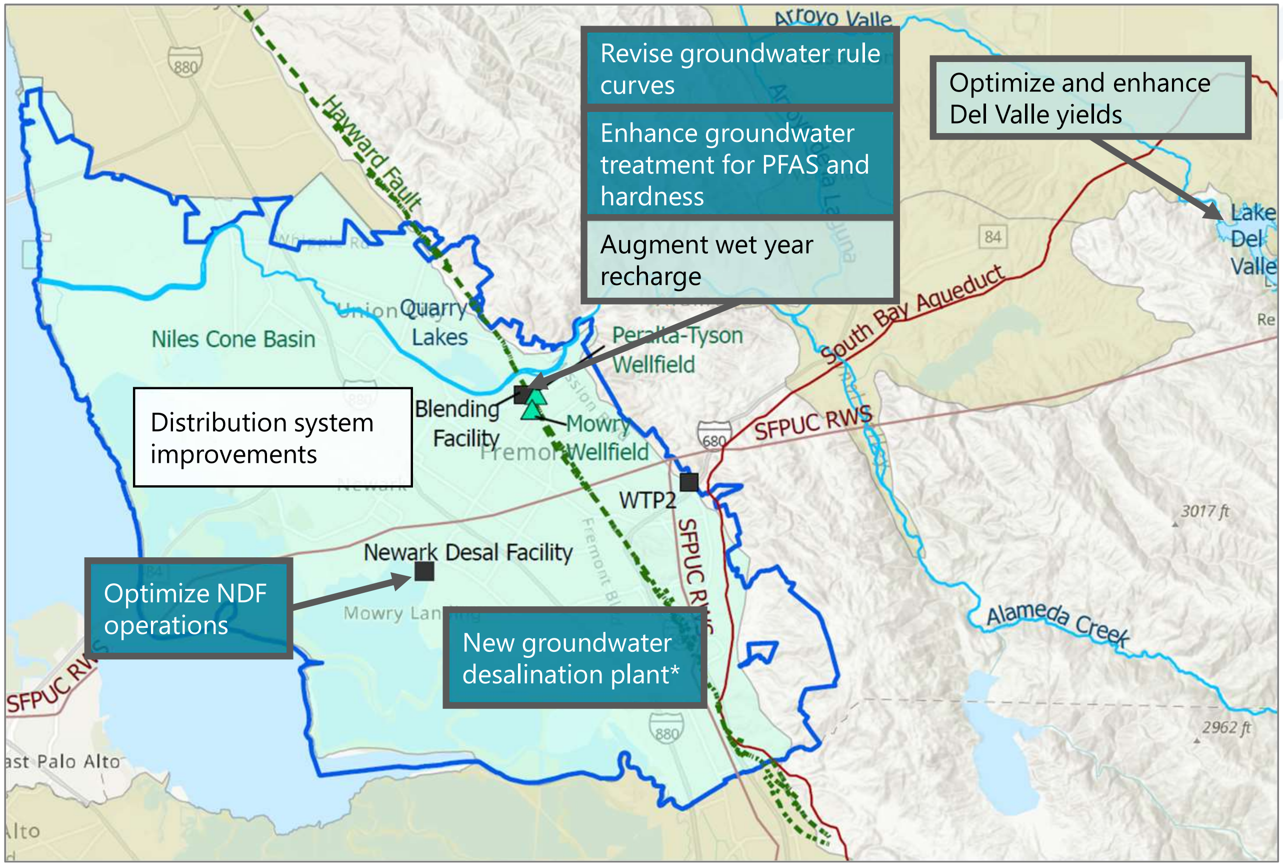
Capital Cost: $240M

Unit Cost: $3,000/AF

Shortage Frequency: 4 in 100 years

Maximum Annual Shortage: 6,000 AF

6 - Increase Local Reliance - Large Changes (GW Treatment, Optimization, & Desal)



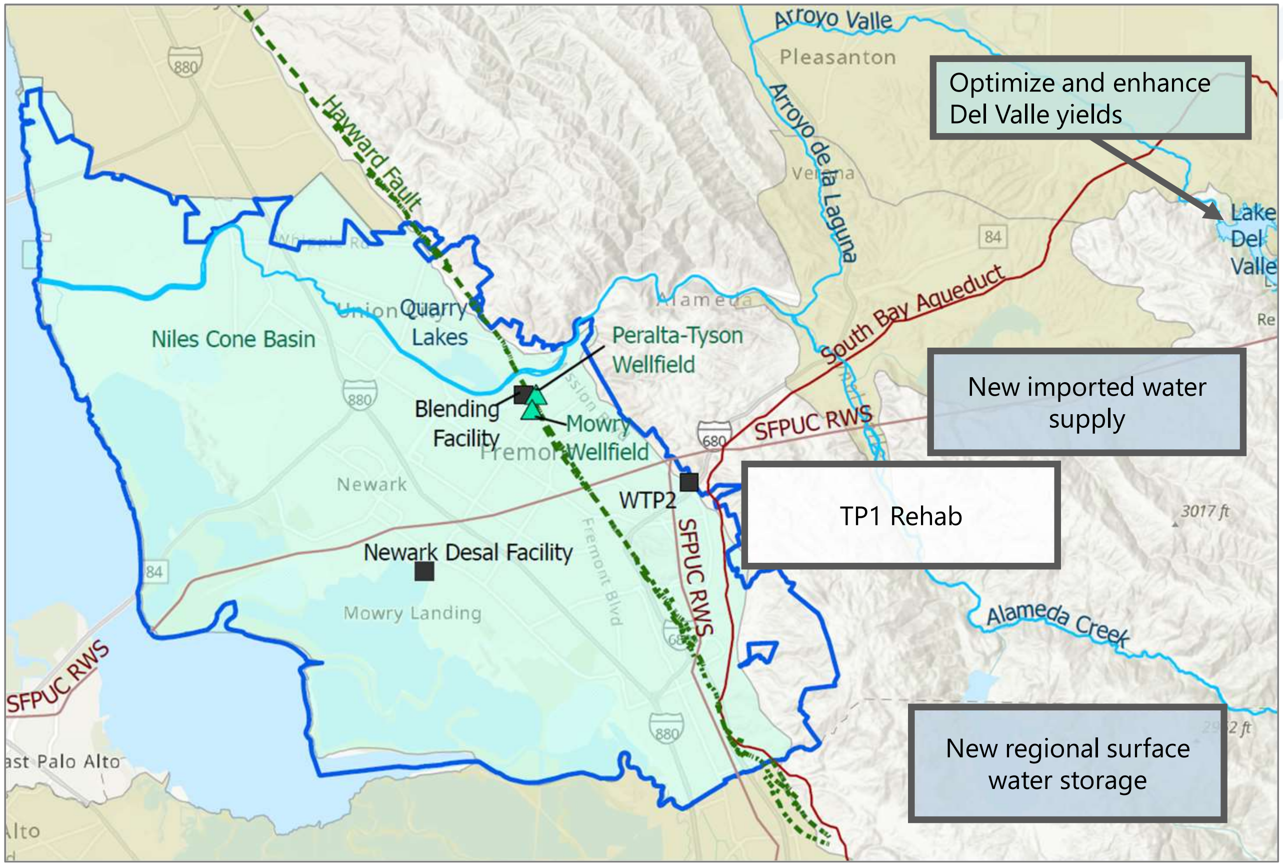
Capital Cost: $440M

Unit Cost: $2,700/AF

Shortage Frequency: 3 in 100 years

Maximum Annual Shortage: 7,000 AF

7 - Improve Imported Water Supply Reliability



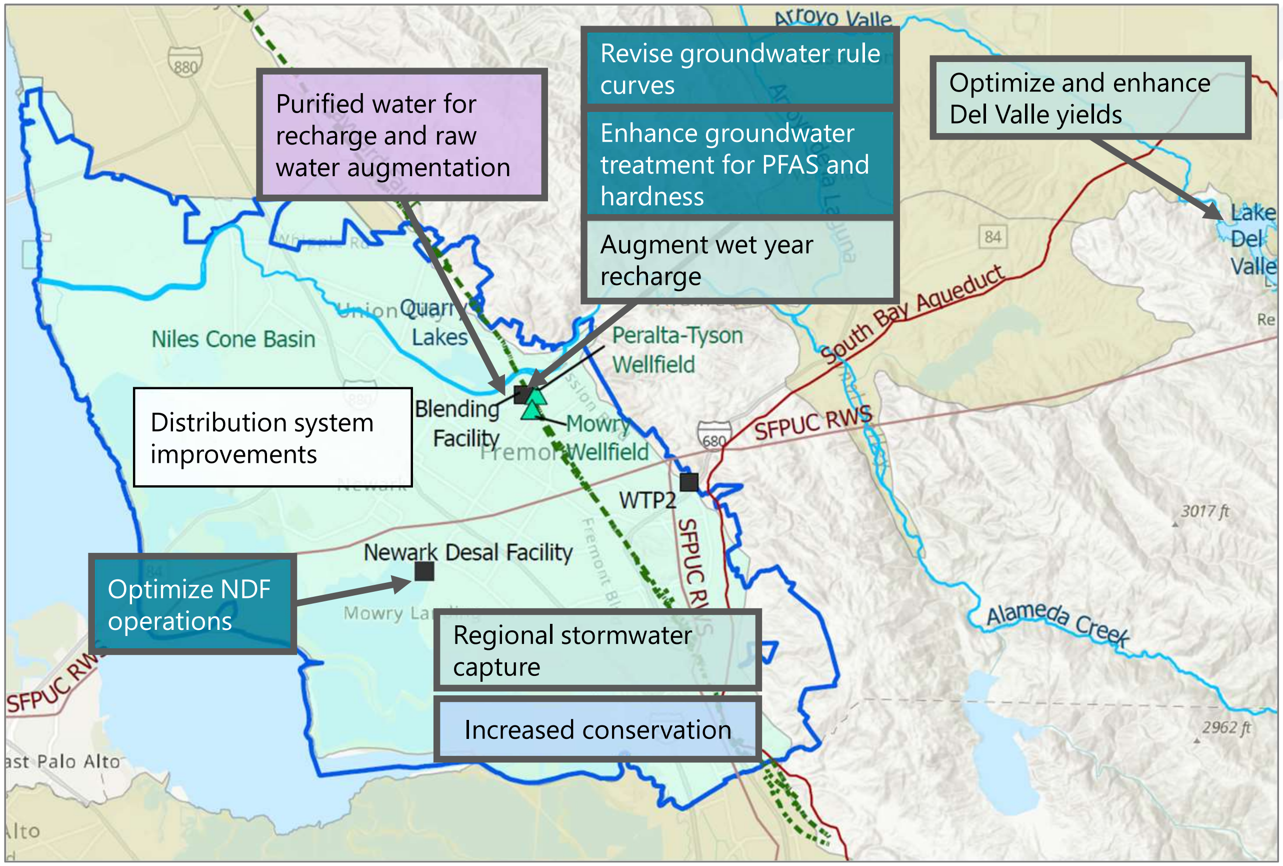
Capital Cost: $30M

Unit Cost: $2,600/AF

Shortage Frequency: 2 in 100 years

Maximum Annual Shortage: 9,000 AF

8 - Increased Environmental Stewardship (Multiple Benefits)



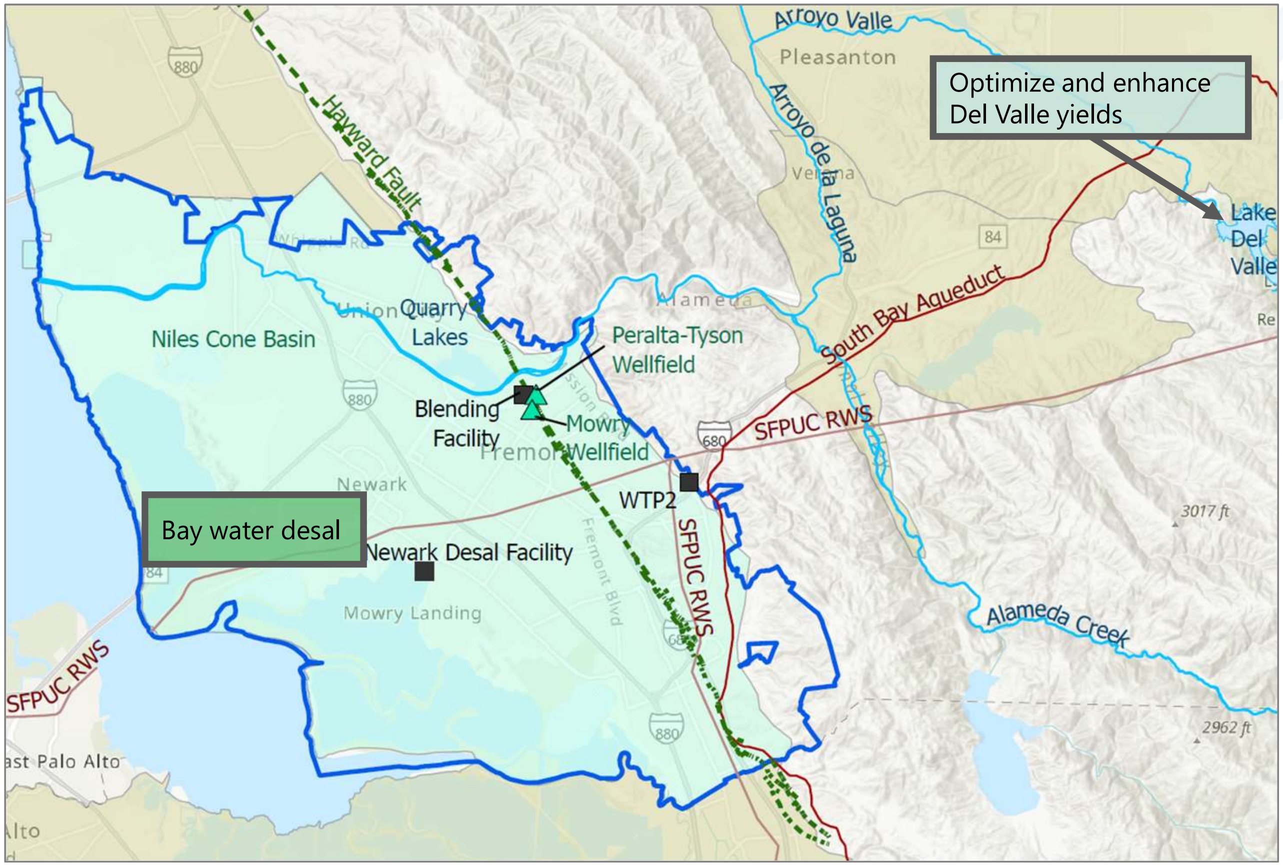
Capital Cost: $1,000M

Unit Cost: $3,200/AF

Shortage Frequency: 0 in 100 years

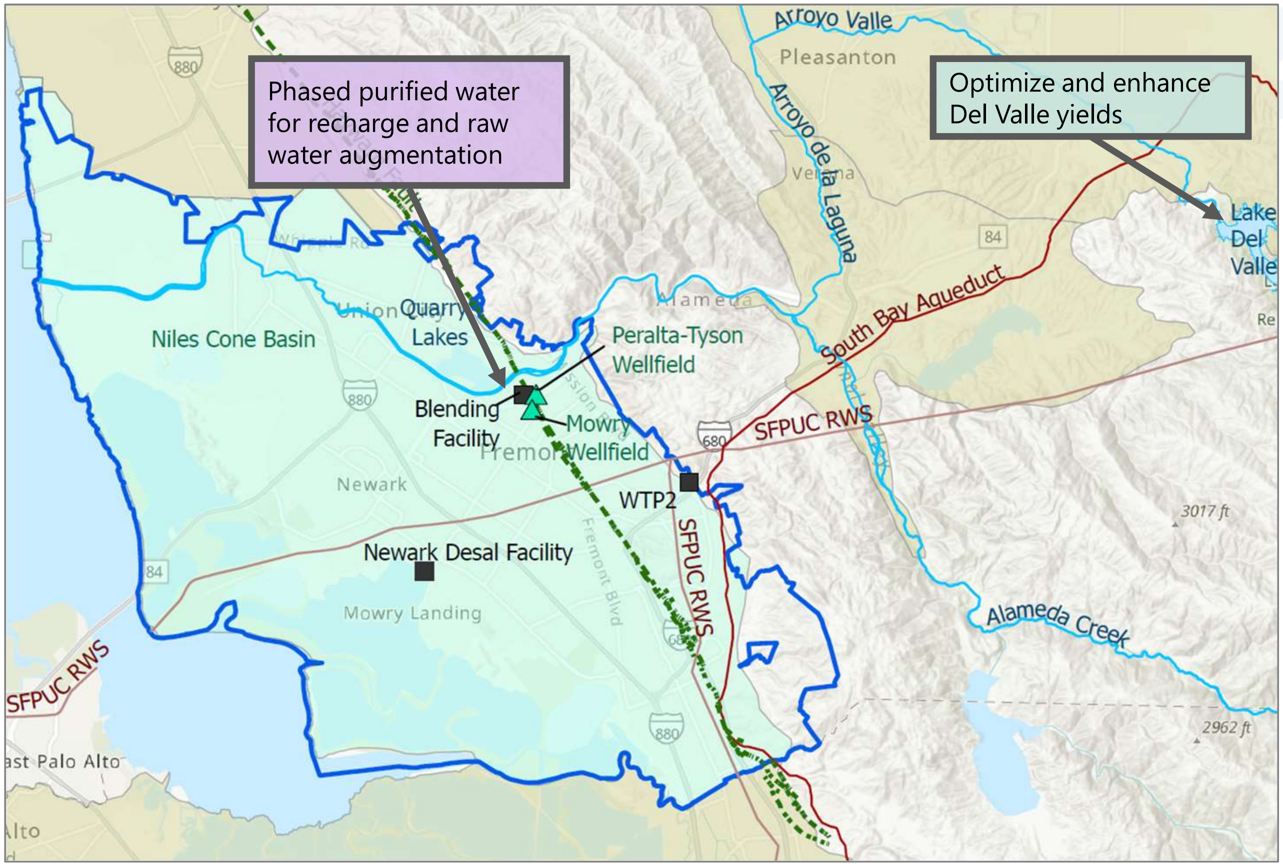
Maximum Annual Shortage: 0 AF

9 - Develop Local Drought-Resilient Supply (Desal)



Capital Cost: $660M
Unit Cost: $3,200/AF
Shortage Frequency: 0 in 100 years
Maximum Annual Shortage: 0 AF

10 - Develop Local Drought-Resilient Supply (Reuse-GW Recharge)



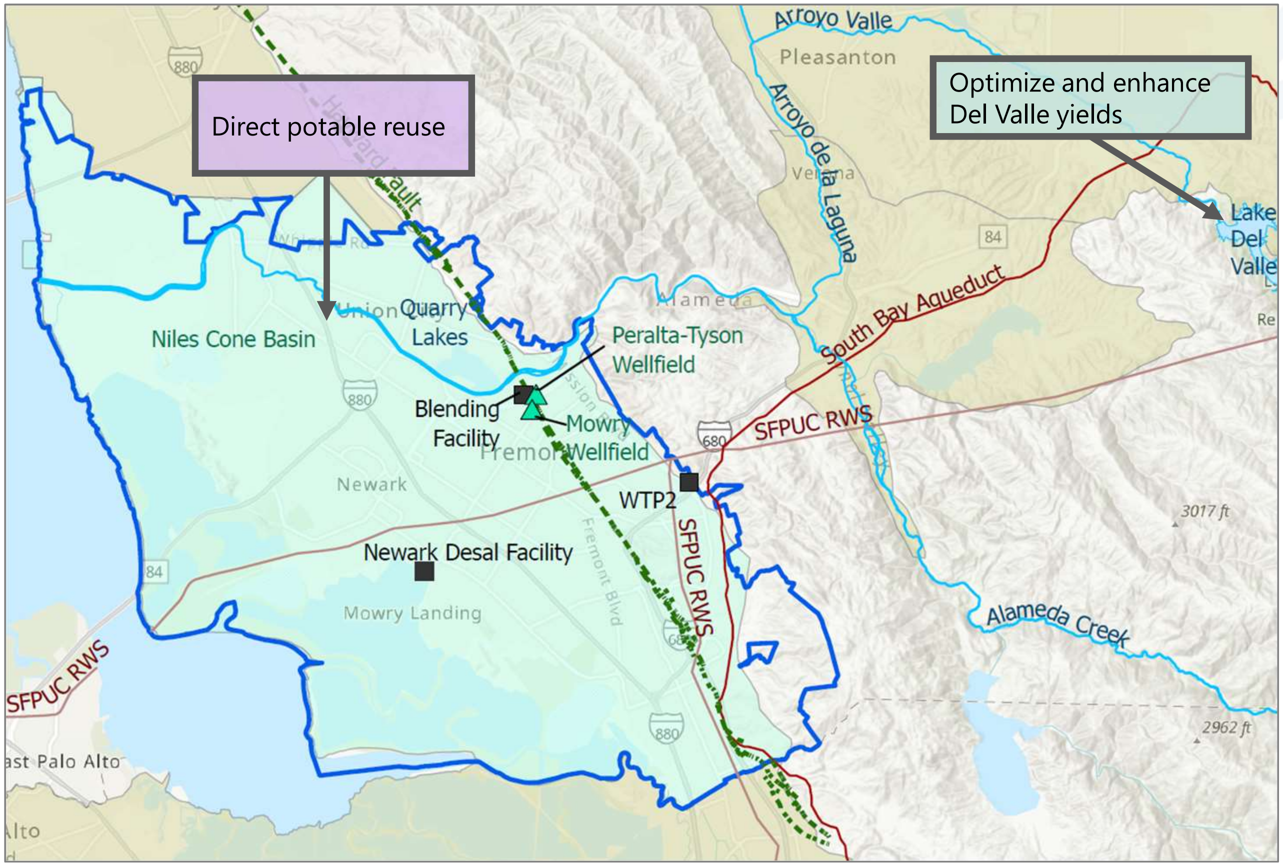
Capital Cost: $800M

Unit Cost: $3,200/AF

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

11 - Develop Local Drought-Resilient Supply (Reuse-Direct)



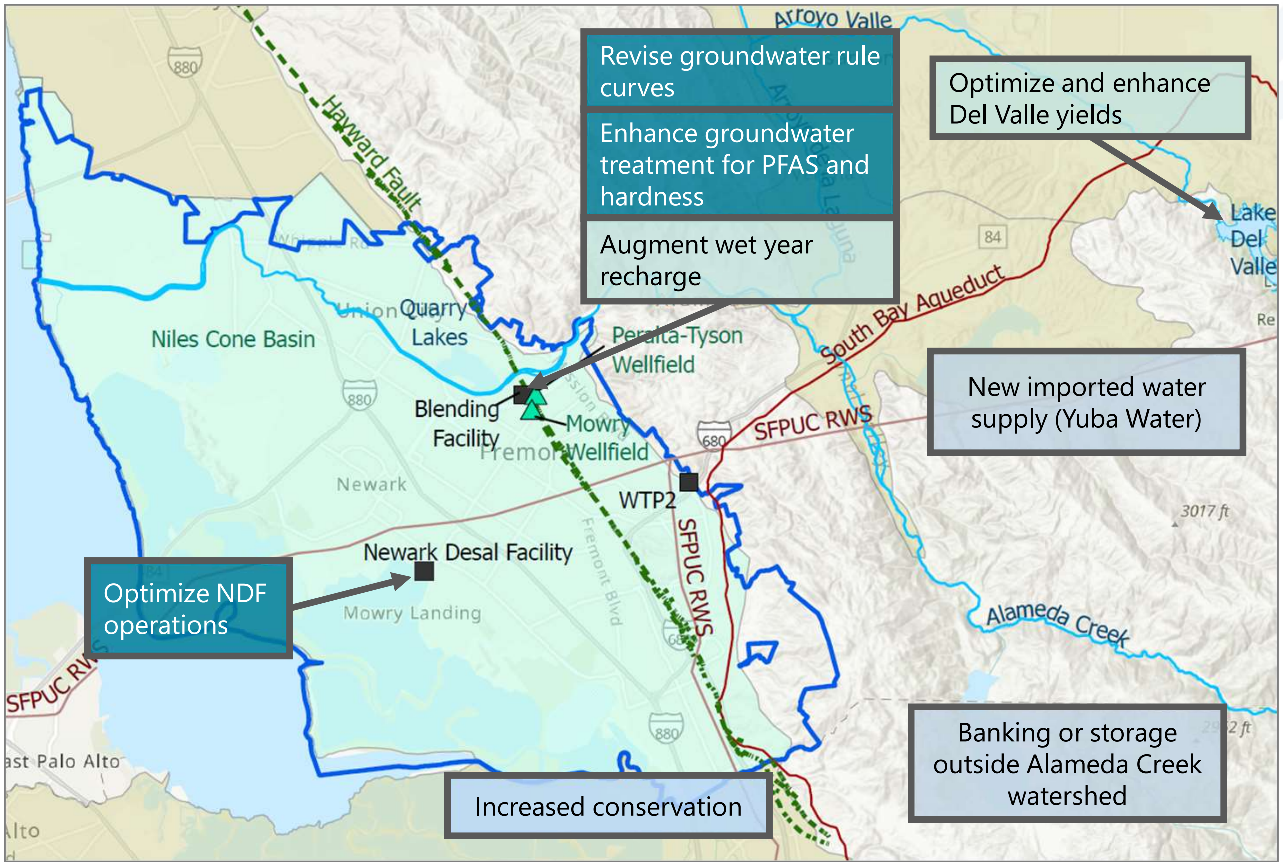
Capital Cost: $720M

Unit Cost: $3,100/AF

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

12A – Staff Recommendation, Phase 1



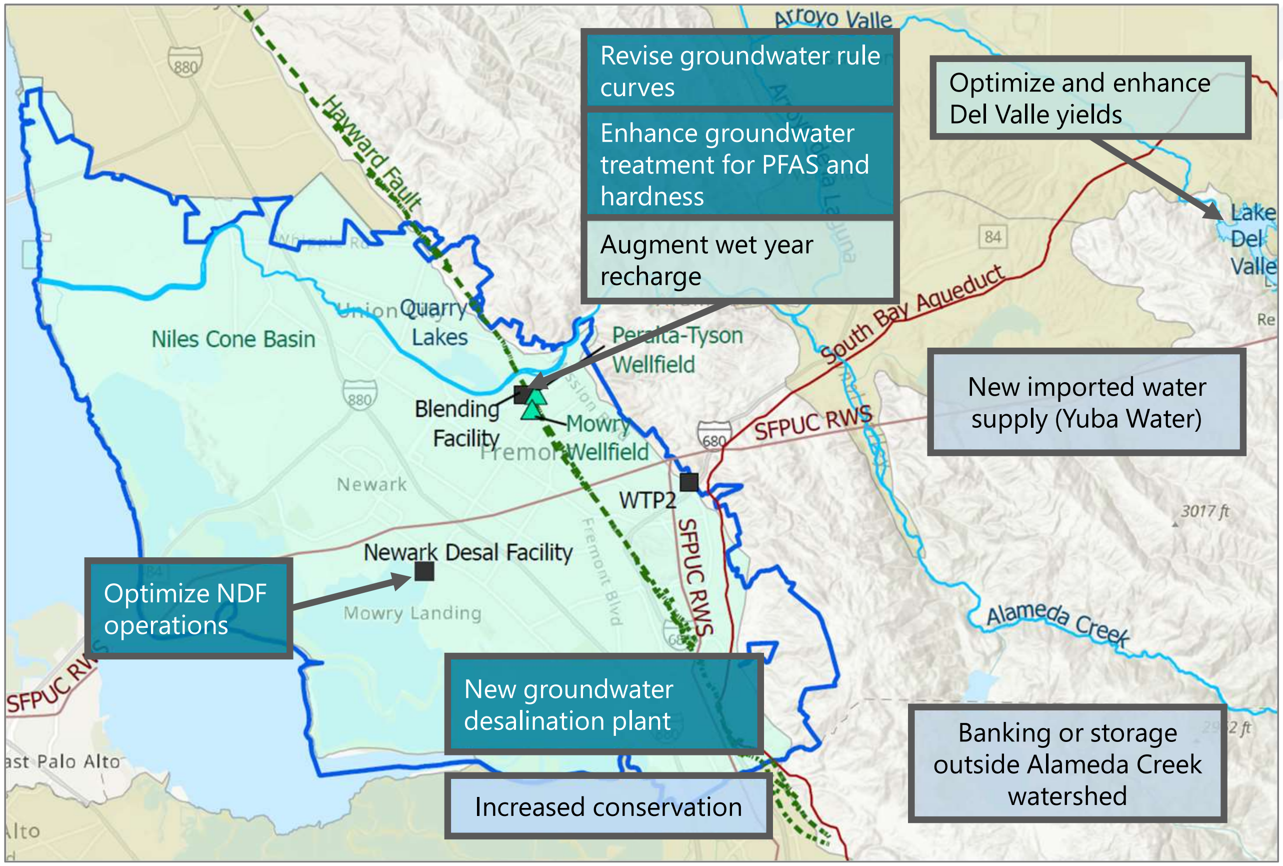
Capital Cost: $200M

Unit Cost: $2,800/AF

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

12B – Staff Recommendation, Phase 2



Capital Cost: $420M (+$220M)*

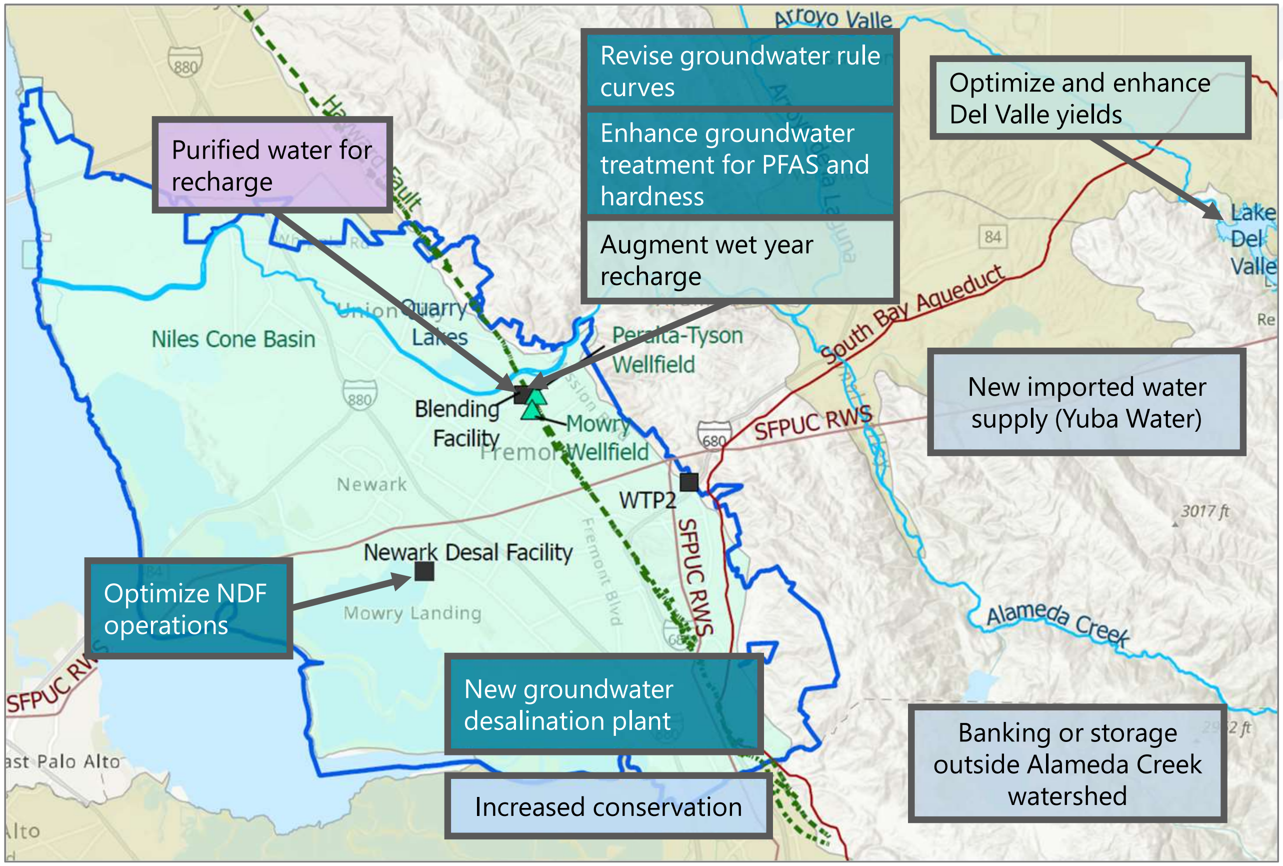
Unit Cost: $2,800/AF*

Shortage Frequency: 0 in 100 years

Maximum Annual Shortage: 0 AF

*Note that for 12A, 12B, and 12C, costs are cumulative
(so 12B includes the costs for 12A, 12C includes costs for 12A and 12B)

12C – Staff Recommendation, Phase 3



Capital Cost: $1,000M (+$580M)*

Unit Cost: $3,200/AF*

Shortage Frequency: 0 in 100 years

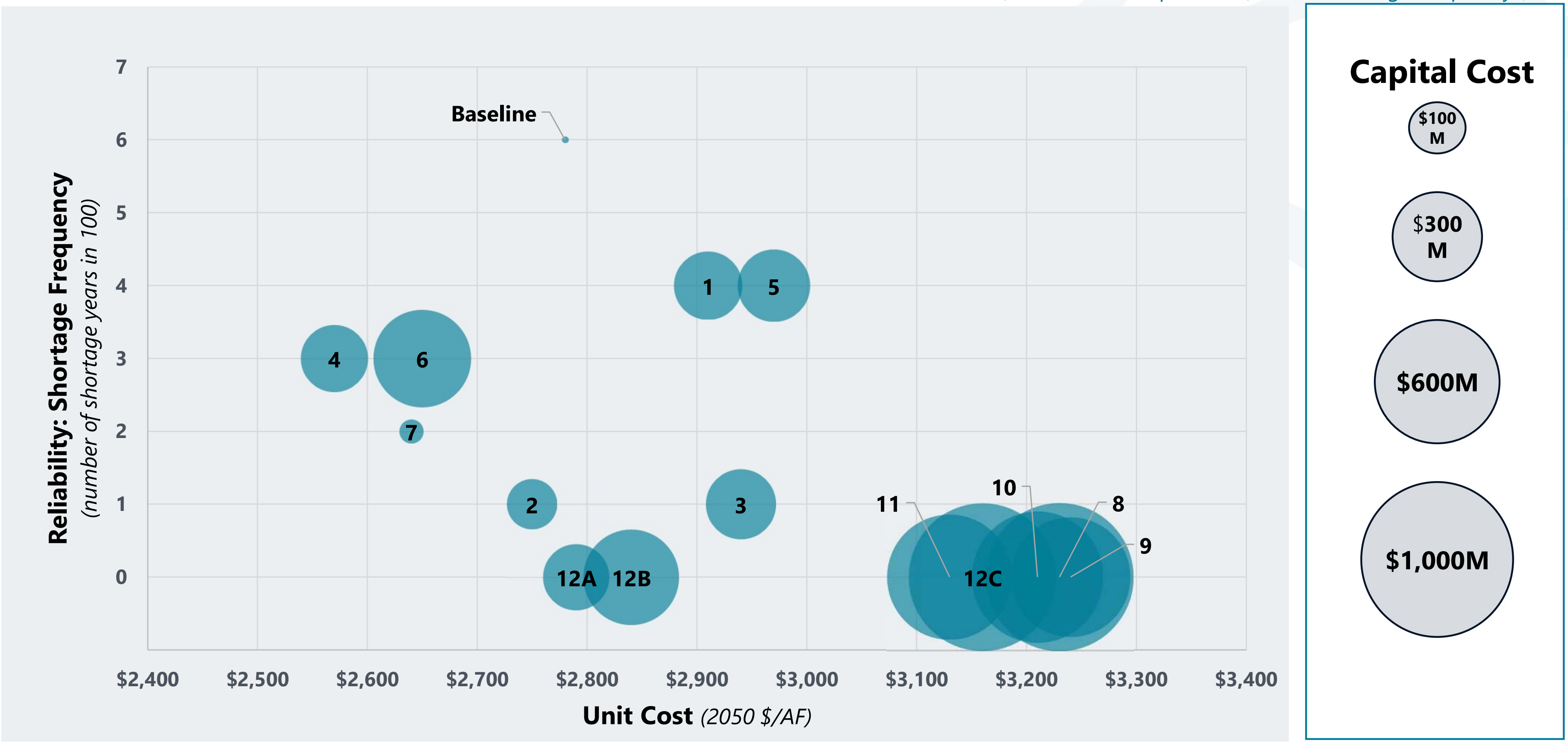
Maximum Annual Shortage: 0 AF

*Note that for 12A, 12B, and 12C, costs are cumulative
(so 12B includes the costs for 12A, 12C includes costs for 12A and 12B)

Reference Slides

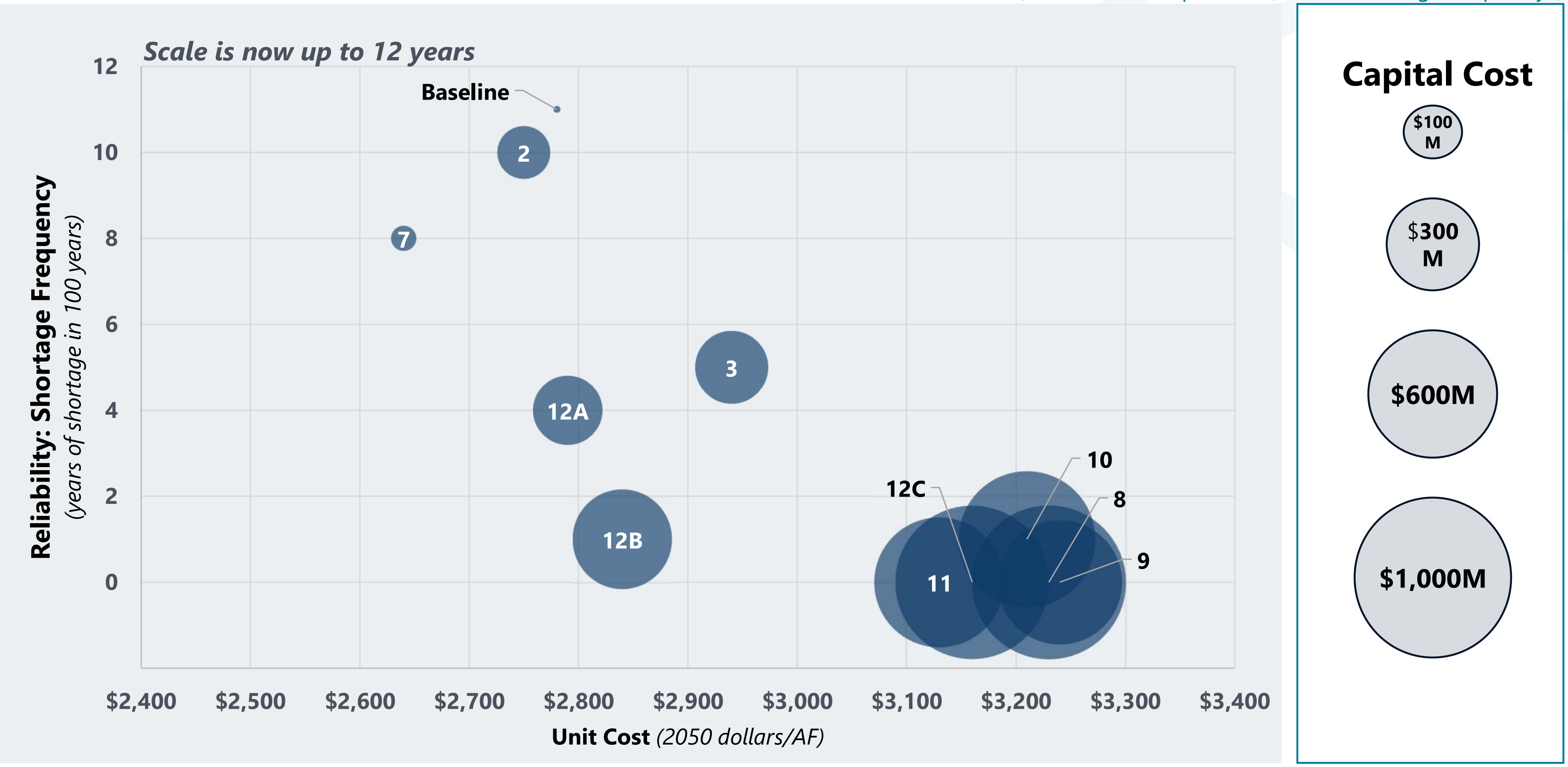
Scenario B Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-12)



Scenario C Reliability vs. Cost*

* Cost (unit cost and capital cost) versus shortage frequency (1-12)



Reliability (Scenario B) vs. Local Control